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ABSTRACT

The movement and location patterns of recent medical school graduates is analyzed within the context of overall demographic, social and economic changes occurring within the U.S. Special emphasis is given to the role of medical training institutions and State financing policies of medical schools. Estimates are provided of the number of physicians locating in a state as a result of a unilateral increase in that State's public medical school graduates. The author concludes that physician movements are similar in many ways to the overall white male migration within the U.S. The analysis of the biographic history of eleven years of medical school graduates showed that the relationship between place of practice and certain institutional factors is more complex than is commonly believed. A quantitative model is generated to test theories about factors affecting physician migration. This model is then used to estimate the effect of alternative State and national policies to effect physician migration. A bibliography is included. (Author)

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THE MIGRATION OF THE 1955-1965 GRADUATES OF AMERICAN MEDICAL SCHOOLS

Philip J. Held

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PREFACE

This is one of a continuing series of reports of the Ford Foundation sponsored Research Program in University Administration at the University of California, Berkeley. The guiding purpose of this Program is to undertake quantitative research which will assist university administrators and other individuals seriously concerned with the management of university systems both to understand the basic functions of their complex systems and to utilize effectively the tools of modern management in the allocation of educational resources.

The movement and location patterns of recent medical school graduates is analyzed within the context of the overall demographic, social and economic changes occurring within the U.S. Special emphasis is given to the role of medical training institutions and state financing policies of medical schools. Estimates of the number of physicians locating in a state as a result of a unilateral increase in that state's public medical school graduates are provided.

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CHAPTER I

INTRODUCTION

The distribution of physicians in the U.S. is a subject of discussion and concern to government and educational officials on all levels.[1] The concern is over the unequal distribution by all geographic units of aggregation, and by alternative methods of increasing the stock of physicians both locally and nationally.

In 1967 the U.S. had an average of 132 non-federal physicians providing patient care per 100,000 civilian population (Table 1-1). However, the physician to population ratio shows wide variations, with a low of 86 in the East South Central division (Chart 1) and a high of 164 in New England. In general, the Northeast and the Pacific states have high ratios with the Midwest and Southern states having low ratios. But this is only very general, with significant exceptions existing within all these areas.[2]

The rapidly increasing costs of medical care and the projection of continuing increases in costs as the demand for care is expanded under various government programs provide additional incentives to

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[1] See Report of the National Advisory Commission on Health Manpower, 2 vols., U.S. Government Printing Office, Washington, 1970. Also the Carnegie Commission on Higher Education, Higher Education and the Nation's Health, McGraw-Hill, New York, 1970. R. Fein, G. I. Weber, Financing Medical Education: An Analysis of Alternative Policies and Mechanisms, McGraw-Hill, New York, 1971. Also R. Fein, The Doctor Shortage, The Brookings Institution, Washington, 1967.

[2] For example, in 1970 New Orleans, Miami, Nashville and Lexington SMSA's had higher physician per 100,000 population ratios than the ratio in the Los Angeles-Long Beach SMSA (206, 265, 211, 351, 202 respectively). Source: J. N. Haug, G. A. Roback and B. C. Martin, Distribution of Physicians in the U.S., 1970, (AMA, Chicago, Illinois), Table 14.

TABLE 1-1

Active Non-Federal Physicians Providing Patient Care
Per 100,000 Civilian Population by Census Region
and Geographic Division in 1967[a/]

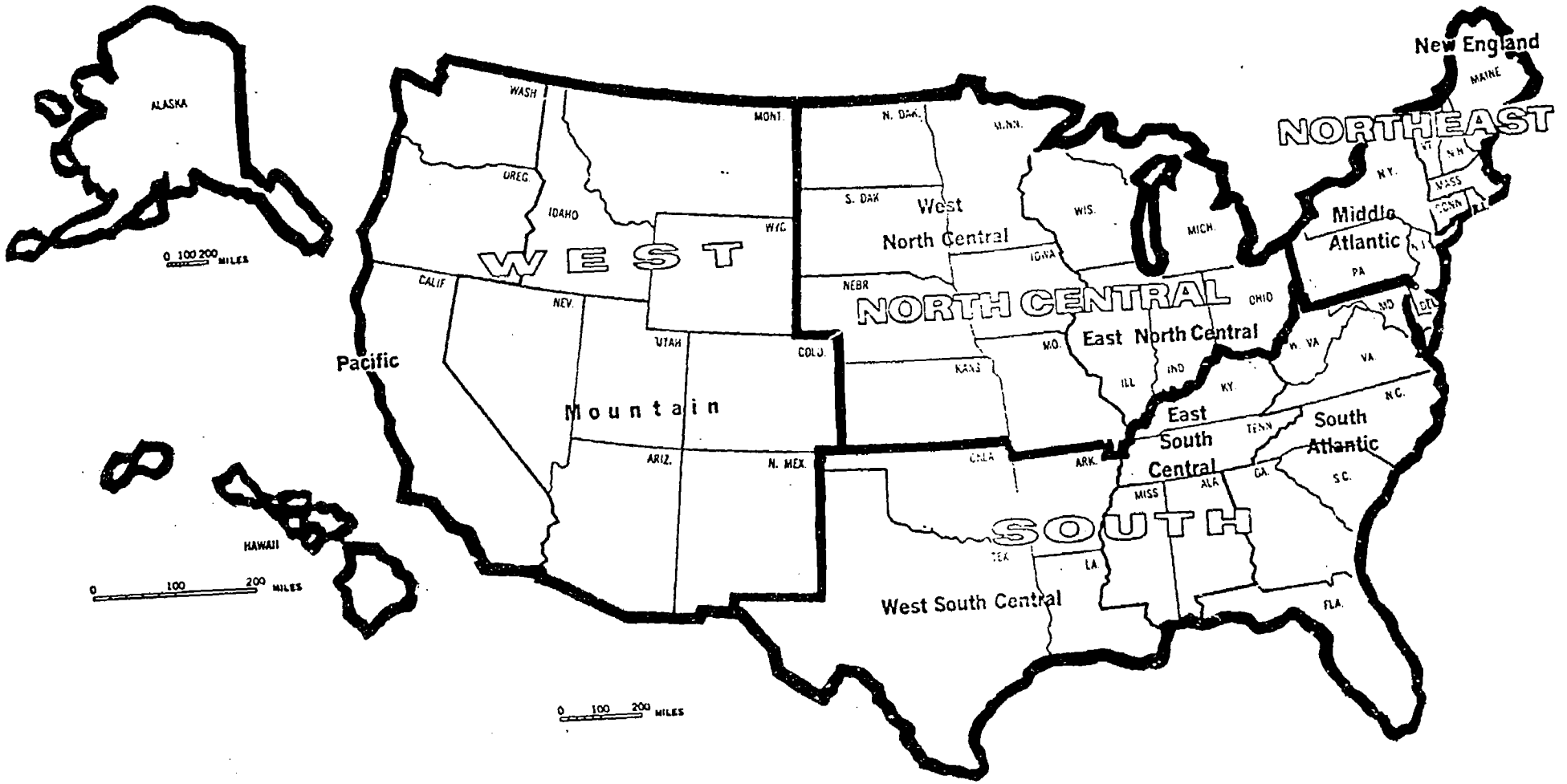
Region	Division	Physicians/100,000 Population
U.S.		132
Northeast		169
	New England	164
	Middle Atlantic	171
North Central		120
	East North Central	122
	West North Central	117
South		104
	South Atlantic	113
	East South Central	86
	West South Central	102
West		146
	Mountain	121
	Pacific	155

a/ Includes M.D.'s, D.O.'s, Interns and Residents.

Source: U.S. Department of Health, Education and Welfare, Health Manpower Source Book Section 20, P.H.S. Publ. No. 263, Washington, U.S. Government Printing Office, 1969, Table 48, page 57.

CHART 1

CENSUS REGIONS AND GEOGRAPHIC DIVISIONS OF THE UNITED STATES



U.S. DEPARTMENT OF COMMERCE
BUREAU OF THE CENSUS

increase the supply of physicians both locally and nationally. However, the difficulty of increasing the supply of physicians is compounded by the present method of financing medical education which relies very heavily on state support. Since the benefits of state funded medical education will not necessarily flow to the residents of the state providing the support, the question of the final location of medical school graduates is given added emphasis.

Dynamic and Static Concepts of the Physician Supply

Physician population ratios are a stock (static) concept in that they represent the entire supply of physicians at some point in time. This stock is changing continually as physicians are added and subtracted from the stock. The national stock is decreased as physicians retire, die and leave the country, while the local supply can decrease with all the above, plus the migration of physicians out of the area.

There is only limited information available on the movement of active post-training physicians. Based on a sample of early 1940 graduates, it was found that approximately six percent of the post-training physicians had relocated their practice to another state. Because of World War II, these graduates are not likely to be a representative sample.[3] Whatever the case, however, the increase

[3] For evidence of physician mobility once established, see: H. G. Weiskotten, W. S. Wiggins, M. E. Altendorfer, M. Gooch and A. Tipner, "Changes in Professional Careers of Physicians: An Analysis of a Resurvey of Physicians who were Graduated from Medical School in 1935, 1940 and 1945," The Journal of Medical Education, November, 1961. Changes in physicians' careers between 1950 and 1959 were measured. For physicians in private practice, for the classes of 1935, 1940 and 1945, 4 percent, 7 percent and 6 percent respectively had changed their location of practice to another state. Approximately 7 percent additional of the private practitioners had changed location within their state over the ten-year period; pp. 1581-1584.

in group practice should provide more mobility in the future as clientele and experience become more transferable.

The national stock of physicians is increased by the addition of new graduates to the labor force and the flow of foreign-educated physicians to the United States, some of whom are U.S. citizens returning home after schooling abroad.[4] Foreign-educated physicians have recently become an indispensable addition to the U.S. stock of physicians, amounting to twenty-five percent of the newly licensed physicians in 1970.[5]

The local stock of physicians is increased by the addition of recent graduates and older physicians who have migrated from some other region. However, it is the addition of the recent graduates which provides the principle dynamic element of change in the local stock of physicians.

While the mobility of established physicians is uncertain, recent graduate physicians, undergoing various stages of graduate training and government service, are the essence of a mobile labor force. Competing in a national market for residencies, these physicians

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[4] In 1966-67, there were an estimated 2,325 U.S. citizens in foreign medical schools and 187 licenses were issued in the same year to American graduates of foreign medical schools (excluding Canadian schools). Source: U.S. Department of Health, Education and Welfare; Health Manpower Source Book Section 20, PHS publication No. 263, U.S. Government Printing Office, Washington, D.C., 1969, p. 14.

[5] See Max H. Parrott, Physician Manpower and Medical Education, Report of the Board of Trustees, American Medical Association, Report: O (A-71) mimeo. For a general reference on foreign-educated physicians see: H. Margulies, L. S. Bloch, Foreign Medical Graduates in the United States, Cambridge, Massachusetts, Harvard University Press, 1969.

move about considerably with some physicians doing graduate training in four different states, and forty percent doing graduate training in more than one state.[6]

Although the physician population ratio shown in Table 1-1 and similar stock measurements are a static concept, some understanding of the dynamics of changes can be gained from the analysis of such data. Table 1-2 shows the net and gross flows of American-educated physicians between division of graduation and division of practice. Table 1-2 was derived from a published stock table (1967) and shows what the cumulative flows have been over time.

Table 1-2 includes federal physicians, interns and residents. These three groups account for approximately twenty-five percent of the physician stock, which makes analysis of voluntary migration (to place of practice) difficult with such figures.[7]

As will be shown later, the unpublished data available for this project indicate that published stock figures, such as in Table 1-2, may not provide an indication of the current flows of physicians. However, Table 1-2 can still provide a general description of physician movement in the U.S.[8]

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[6] In a sample of 1,849 physicians, the percentages with 2, 3 and 4 different states in their medical history were: 36.0, 6.4 and 0.4%, respectively. In general, the number of different states was a function of the location and quality of the medical school.

[7] J. N. Haug, G. A. Robach, B. C. Martin, Distribution of Physicians in the United States, 1970, Chicago, American Medical Association, 1971, p. 3.

[8] The word "movement" is used as distinguished from "migration." Although the definition of migration is broad enough to cover such changes in location, the intention of this paper is to use migration as a movement from place of "residence" or "occupation" to a new location of "occupation." Since many of the physicians included in Table 1-2 are returning home after graduation from medical school, the word "migration" should be used with caution.

TABLE 1-2

Gross and Net Exchange of the Stock (All Ages)
of American-Educated Physicians between Region of Graduation and
Region of Practice, December 31, 1967[a/]

Region of Graduation		Northeast	North Central	South	West	Total	Net Exchange as a Percent of Local Production
Northeast	-		6,015	10,565	8,853	25,433	
	+		6,515	8,783	822	16,118	
	NET		498	-1,782	-8,031	- 9,315	-12.3
North Central	-	6,513		9,013	18,032	33,558	
	+	6,015		5,888	1,052	12,950	
	NET	- 498		-3,130	-16,980	-20,608	-26.3
South	-	8,783	5,883		7,280	21,946	
	+	10,565	9,013		1,343	20,921	
	NET	1,782	3,130		-5,937	- 1,025	- 1.4
West	-	822	1,052	1,343		3,217	
	+	8,853	18,032	7,280		34,165	
	NET	8,031	16,980	5,937		30,948	149.6

NOTE: A minus sign indicates that the region on the left side of the table lost physicians to the region at the top of the table. Local production in the extreme right column refers to the production of the region listed on the left.

[a/] Graduates of active schools only; excludes graduates in foreign countries, in American possessions and U.S. military overseas.

Source: Calculated from C.N. Theodore, G.E. Sutter, H.N. Huang, Medical School Alumni, 1967, American Medical Association, Chicago, 1968, Table F, page 17.

The overall picture of movement, as shown by Table 1-2 is the following:

a. Gross flows are usually several times as large as the net flows.

b. All regions showed a net loss to the West.

c. The North Central region had a net loss to all other regions.

d. The North Central region had the largest overall net loss both in absolute and percentage terms.

e. The North Central region had the largest gross and net loss to any single other region (the West).

f. The South showed a net gain from the Northeast and the North Central, but a net loss to the West.

g. In both absolute and percentage terms, the South had the smallest (except for the West) overall net loss, -1.4 percent.

h. The West showed an overall net gain of 150 percent, i.e., for every graduate of a school in the West, an additional 1.5 graduates migrated to the West.

The purpose of this research will be to analyze the migration of a subset of physicians from place of residence prior to medical school to their place of practice in 1971. The subset of physicians will be the recent graduates (1955-1965) of American medical schools who are providing direct patient care and are not employed by the federal government or a medical school. There will be occasional deviations from this subset, for example, medical school physicians may be included for certain topics, but in general the discussion will be focused on "private practice" physicians caring for patients. The tabulation of physicians by type of practice and employer is shown in Table 1-3.

TABLE 1-3

Type of Practice and Type of Employment in 1971
for the 1955-1965 Graduates of U.S. Medical Schools[a]

Type of Employment		Type of Practice						
		Training	Direct Patient Care	Medical Teaching	Medical Research	Administration	Other	Total
Solo-Self-Employed	N	110	21,650	34	135	68	330	22,336
	%	.5	97.0	.2	.6	.3	1.5	100.0
Partnership Self-Employed	N	90	14,967	57	56	28	233	15,431
	%	.6	97.0	.4	.4	.2	1.5	100.0
Group Practice	N	124	9,890	54	69	42	166	10,345
	%	1.2	95.6	.5	.7	.4	1.6	100.0
Medical School	N	1,974	2,150	1,848	2,508	518	143	8,641
	%	22.8	24.9	15.6	29.0	6.0	1.7	100.0
Non-Governmental Hospital	N	1,926	2,950	182	495	211	194	5,958
	%	32.3	49.5	3.1	8.3	3.5	3.3	100.0
Local or State Government Hospital	N	1,465	2,165	289	275	610	128	4,932
	%	29.7	43.9	5.9	5.6	12.4	2.6	100.0
Military	N	536	4,639	144	243	339	89	5,990
	%	8.9	77.4	2.4	4.1	5.7	1.5	100.0
Veterans Administration & Public Health Service	N	523	1,202	150	637	322	62	2,896
	%	18.1	41.5	5.2	22.0	11.1	2.1	100.0
Other	N	48	617	16	242	269	703	1,895
	%	2.5	32.6	.8	12.8	14.2	37.1	100.0
Total	N	6,796	60,239	2,274	4,660	2,407	2,048	78,424
	%	8.7	76.8	2.9	5.9	3.1	2.6	100.0

[a]Includes graduates of Canadian schools practicing in the U.S. Excludes 1962 graduates of the California College of Medicine.

Federal physicians will be excluded because their location choices are not voluntary. Interns and residents ("Training" in Table 1-3), are excluded because they have yet to choose a place of practice. Medical school faculty are excluded because it is felt that they are in a different market than the "private practice" physician. The physicians from Table 1-3 that are included in the analysis constitute sixty-six percent of the total 1955-1965 graduates.

The net movement (between division of graduation and division of practice) of the subset of physicians described above and the entire stock for all years is shown in Table 1-4. Table 1-4 includes federal, academic and training physicians, subsequently the two categories shown in Table 1-4 are not entirely comparable. Furthermore, the data are more disaggregated than in previous tables since the nine geographic divisions versus four census regions are used (see Chart 1).

For graduates of all years the net movements are similar to that shown in Table 1-2. There has been an overall movement west, at the expense of the other divisions. In the west, the Mountain states have been gaining more in terms of local production than has the Pacific division.

One substantial difference shown by the disaggregated data is the net positive gain for the South Atlantic division, compared to the overall net loss for the Southern Region (Table 1-2).

When the flows of recent graduates (right side of Table 1-4) are compared to the net flows for all years of graduation, the general movement westward is again confirmed. The losses of the midwest are

TABLE 1-4

The Net Exchange of Physicians between Division of Graduation and Division of Practice as a Percent of Local Production for Selected Years of Graduation[a]

Division of Graduation	Years of Graduation	
	All Years[b]	1955-1965[c]
New England	- 7.3%	19.1%
Middle Atlantic	-13.9	-21.5
East North Central	-22.9	-26.5
West North Central	-32.9	-33.5
South Atlantic	6.68	- 2.5
East South Central	-18.1	-23.7
West South Central	- 2.9	-11.1
Mountain	195.4	194.4
Pacific	139.3	171.0

NOTE: A minus sign indicates that the division experienced a net loss.

[a]Graduates of medical schools located in the division.

[b]All graduates of active medical schools. Date of census--December 31, 1967. Includes interns, residents, fellows, and federal physicians, but excludes Doctors of Osteopathic medicine, graduates of foreign medical schools, physicians with addresses in U.S. Possessions and military overseas.

[c]Based on the place of practice in April, 1971. Only non-federal, non-academic physicians in direct patient care are included. For source of data, see Appendix 3.

SOURCE: Calculated from C. N. Theodore, G. E. Sutter, H. M. Huang, Medical School Alumni, 1967, American Medical Association, Chicago, 1968, Table F, page 17.

again shown to be substantial. The losses of the Middle Atlantic and the West South Central states are more pronounced in the case of the recent graduates only. Finally, the net flow to New England is very large as opposed to a negative net flow when all graduates are considered.

Because the subsets of physicians in Table 1-4 are not quite comparable, only general inferences can be drawn as to the reasons for the different flows. For example, the positive net flow for the South Atlantic graduates of all years could be the effect of the substantial number of federal physicians in the Washington D.C. area. Table 1-4 does show, however, that to analyze the net exchange of physicians for policy analysis, one should use a limited or smaller subset of the stock rather than the gross stock at some point in time.

The Distribution of Medical School Places in the U.S.

Although Tables 1-2 and 1-4 show substantial movement of physicians between place of graduation and place of practice, this fact is incomplete by itself. The distribution of medical school places is uneven when compared with the distribution of population, so it should not be surprising that there is substantial movement of medical school graduates.

The distribution of medical school graduates by region and division of graduation is shown in Table 1-5. There were almost

TABLE 1-5

Medical School Graduates by Region and Division of Graduation in 1967-68

Region (Division)	Graduates				Graduates Per 100,000 Population		
	Public	Private	Total	Public as a Percent of Total	Public	Private	Total
U.S.	4,452	3,478	7,930	56.2%	2.27	1.78	4.05
Northeast	497	1,722	2,219	22.4	0.39	4.24	4.63
New England	44	407	451	9.8	0.39	1.52	4.02
Middle Atlantic	453	1,315	1,768	25.6	1.23	3.58	4.81
North Central	1,577	780	2,357	66.9	2.90	1.44	4.34
East North Central	1,032	527	1,559	66.2	2.68	1.37	4.05
West North Central	545	253	798	68.3	3.43	1.60	5.03
South	1,776	765	2,541	69.9	2.92	1.25	4.17
South Atlantic	915	367	1,282	71.4	3.13	1.26	4.39
East South Central	335	191	526	63.7	2.60	1.47	4.07
West South Central	526	207	733	71.8	2.80	1.05	3.85
West	602	211	813	74.1	1.84	0.65	2.49
Mountain	161	0	161	100.0	2.06	0.00	2.06
Pacific	441	211	652	67.6	1.78	0.84	2.62

SOURCE: Computed from data in: U.S. Department of Health, Education, and Welfare, Health Manpower Source Book Section 20, P.H.S. Publication No. 263, Washington, D.C., U.S. Government Printing Office, 1969, Table 9, page 10; and U.S. Bureau of Census, Statistical Abstract of the United States 1967, Washington, D.C., 1967, page 12.

8,000 graduates from U.S. schools in 1967-68, with thirty-two percent graduating from schools in the South, the highest for any single region. The North Central and Northeast follow with just under thirty percent. By contrast, only 10.3 percent of the 1968 class graduated from schools in the West.

The U.S. population is distributed approximately like the medical school places. Whereas the South had thirty-two percent of the graduates, it had thirty-one percent of the population. The Northeast and the North Central also had less percentage of the population than medical school graduates, but the difference was even greater than for the South. Since both these distributions add up to one, it is not surprising that the West was producing only ten percent of the graduates, while seventeen percent of the population resided in the West.

The same uneven distribution of places can be seen by the number of places per 100,000 population. While in the entire U.S., the ratio was 4.05 graduates per 100,000 population, the ratio was at a high of 5.03 in the West North Central division and a low of 2.06 for the Mountain states. The second highest ratio was 4.81 in the Middle Atlantic States and the second lowest was 2.62 in the Pacific states.

Nationally, public medical school graduates were fifty-six percent of the total, but the distribution by region is not uniform.[9] Private medical education predominates in the Northeast, but everywhere else public medical schools predominate. In the

[9]Although the mix of public versus private school graduates was 56 and 44 percent respectively in 1967-68, this proportion has been changing over time. For the 1955 to 1965 graduates, the mix is approximately 46 percent public and 54 percent private school graduates.

Northeast, only twenty-two percent of the graduates were from public schools, while in the West seventy-four percent were from public schools. Both the South and Midwest had approximately sixty-eight percent public school graduates.

If one were to suppose that regional governmental interest was only with the public medical schools, and that private medical schools serve a national market, the distribution of graduates from public medical schools is still skewed. In the Midwest and South, there are 2.9 public school graduates per 100,000 population, while even the West's 1.8 graduates per 100,000 population exceed the Northeast's very low 0.4 public graduates per 100,000 population. While it is true that some private medical schools serve a national market and select students on a national basis, private medical schools, in general, serve a regional market, although the region may be geographically larger than most states.[10]

In conclusion, the distribution of medical school places, whether public, private or both, is not proportional to the population. Therefore, at least some of the movement between place of graduation and place of practice, reported in Tables 1-2 and 1-4, is consistent with even a simple model of labor force behavior.

Furthermore, the size of the differential between population and graduates in the West is very large, and we would expect to and do find considerable movement of physicians to the West. To explain the heavy movement from the Midwest, however, will require more than

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[10] One study has shown a negative relationship between state expenditures on public medical education and the amount of private medical school places in a state, See R. Fein, G. I. Weber, Financing Medical Education, New York, McGraw-Hill, 1971. This suggests that, in general, public and private medical school places are substitutes for each other at the state level.

the casual case presented for the movement of physicians to the West. On the evidence presented in Table 1-5, one might expect some movement from the Midwest, but the magnitude of the flow is so large that a more complete explanation is needed. The cases for the Northeast and South are also more subtle and will require further analysis.

Policy Issues in the Location of Physicians

There are a number of unresolved issues for public policy analysis concerning the location of physicians. These issues are primarily concerned with what instruments can be used to alter the distribution of physicians and whether there is an incentive for state governments to finance medical education. Chapter 2 will provide a review of the literature including the results of surveys that indicate what factors should be considered as policy variables in altering the distribution of physicians.

Chapter 3 will show that physician migration has been similar to the movement of white males in society. A case will be presented for considering the migration of physicians within the context of the overall demographic and economic changes occurring in the country.

Chapter 4 will document the institutional relationships for the place of practice of recent medical school graduates. It will be shown that there is a rather complex matrix of institutional factors which differ substantially in many respects, but mainly by the geographic area of practice. It will be shown that there are substantial numbers of mobile physicians who are practicing where they

have had little or no prior contact. The results of a previous and independent study of institutional factors will be shown to be consistent with the analysis of this paper.

The sensitivity of physician migration to economic and professional opportunities will be estimated in Chapter 5. Physician migration patterns will be consistent with a movement towards reduction in physician income differentials, and towards states with high non-pecuniary benefits and high physician population ratios.

In Chapter 6, the mobility of physicians will be shown to be increased by two factors: selectivity of the medical school of graduation and a history of government service. The effects of these two factors on mobility will suggest a possible federal role in subsidizing medical education.

Tentative estimates of the number of physicians locating in a state as a result of a unilateral increase in that state's public medical school graduates will be provided in Chapter 7.

While the net migration of physicians into a state is affected by the number of medical school graduates produced locally, the simulations of the model indicate that the trade-off is less than one-to-one, i.e., for an increase of one hundred public medical school graduates, approximately fifty to eighty new physicians would locate in the state. Thus there is tentative evidence to believe that individual states can increase the number of physicians practicing in that state by investing in public medical schools.

A policy of increasing the number of interns and residents in a state will also induce more physicians to locate in the state, although the response to such policies appears to be generally weak.

Furthermore, some evidence will be presented that the health services provided by medical teaching institutions are substitutes for the services provided by local physicians, although the degree of substitutability is not great.

CHAPTER 2

PREVIOUS RESEARCH ON PHYSICIAN LOCATION

One of the most often quoted studies on the location behavior of physicians is a survey of medical college graduates conducted by Weiskotten, et.al.[1] This report has been widely quoted and has had pronounced effects on the public and private agencies concerned with medical education.

The parts of the report relevant here are the tabulations of biographic data that the authors link to practice location choices. The basic approach was that the place of residence before medical school, place of medical school, place of residency,[2] etc., were the determining factors in choice of a place of practice.

The place of prior residence was felt to be more significant than the location of medical college in determining place of practice,[3] since approximately 60 percent of each class was practicing in the place of prior residence. The location of a graduate's medical college was not totally unrelated to place of practice, in fact, about 55 percent of the public school graduates and about 40 percent (class of 1950) of the private school graduates were practicing in the same state as their school was located.

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[1] H. F. Weiskotten, W. S. Wiggins, M. E. Altendorfer, M. Gooch and A. Tipner, "Trends in Medical Practice--An Analysis of the Distribution and Characteristics of Medical College Graduates, 1915-1950," The Journal of Medical Education, December 1960, pp. 1071-1121. (Hereafter referred to as Weiskotten.)

[2] Some clarification of terminology might be helpful: medical school is considered undergraduate education, internship and residency are graduate training, and place of residency is what one would normally consider their "home."

[3] Weiskotten, op.cit., p. 1086.

The tabulation of graduates with residency training is the result that has often been quoted. Based on the results, shown in Table 2-1, Weiskotten concluded that the place of residency training had more relative importance than prior residency, internship, or medical school in determining place of practice.

Weiskotten's analysis was based on biographic data with little or no application of economic reasoning. In effect, Weiskotten presented some tabulations which were somehow credited with causation in the determination of a physician's place of practice. This was most unfortunate and has probably lead to more misconceptions by policy-makers than any other single article in the literature. Chapter 4 of this paper will present a similar but more thorough set of tabulations of institutional factors regarding place of practice. It will be shown that many of the events compared in Weiskotten are not independent. Furthermore, it will also be shown that one of the most significant parts of the Weiskotten survey was totally ignored by Weiskotten. Approximately twenty-five percent of the physicians in the survey were practicing in a state with which they have had little or no prior institutional contact. Tabulations of the data[4] available for this paper will show that a similar percentage of more recent graduates have the same historical profile.

Other data in Chapter 4 will show that a tabulation of the number of physicians practicing in the same state as where they took their residency training ignores the fact that for many physicians this is also where they were born/raised and went to medical school. It will

[4] See Appendix 3 for a description of the data.

TABLE 2-1

Weiskotten's Data on Place of Practice
and Other Institutional Variables

Percent of Graduates with Residency Training Practicing in Same State as:	Year of Graduation	
	1945	1950
Residency Training	58.8	62.8
Prior Residence	54.6	52.5
Internship	42.3	47.5
Medical College	42.4	42.3

SOURCE: Weiskotten, op.cit., p. 1086.

be shown, however, that a substantial portion of the physician stock is practicing in a state where their only institutional contact[5] was graduate training (internship or residency).

In summary, Weiskotten opened the door to the issue of institutional considerations in the location of physicians. But it was not much more than an opening because their survey failed to ask some questions it should have, and it did not economically analyze the data it did receive.

Although a person's actual behavior may be a better indicator of their true preferences than their stated opinions, it is still worthwhile to record what factors physicians believe to be important in selecting a practice location. A survey by the Board of Higher Education in Illinois did ask such questions of a large sample of physicians. A survey was conducted of the 1952, 1954, 1956, 1958 and 1960 alumni of medical schools located in Illinois (one public and four private schools). The subjective importance of different factors is shown in Table 2-2. Although the list of important factors is long and somewhat redundant, it is still very interesting. The high importance attached to economic and professional considerations is reassuring information in a market economy. The lower position on the scale for the list of institutional factors is surprising, especially in light of the conclusions of the Weiskotten survey. However, it should be noted that all the reasons listed in

[5]This is probably too restrictive. The data available on each physician, while very thorough and extensive, is not exhaustive. For example, it will be shown in Chapter 6 that a history of government service has a strong statistical relationship to the mobility of physicians. But the biographical history of the physician does not indicate where he served his federal service.

TABLE 2-2

Importance of Different Factors on Decisions of Physicians on Practice Location (Percent of All Physician Respondents)[a]

Factor	Rated as "Very Important" or "Important"[b]
General Economic Conditions in the Area	77%
Cultural and Social Opportunities	72
Educational Opportunities for Children	68
Availability of Hospital Appointments	63
Preference of Spouse	50
Postgraduate Training Opportunities	47
Openings for My Specialty	46
Area Need for a Physician	46
Opportunity to Join Other Doctor or Group	38
Born and/or Raised in the Area	37
Place of Residency	34
Place of Medical School	32
Medical School Appointment	30
Place of Internship	27

[a]The scale for each factor included "very important," "important," "of little or no importance," and "no opinion." "It is felt that the percentage rating a factor either very important or important reflects best the importance of that factor."

[b]Based on 1,345 respondents, representing 52 percent response rate.

SOURCE: Board of Higher Education, State of Illinois, Education in the Health Fields, June 1968, Vol. II, Part 3, pp. 4-96.

Table 2-2 were rated as "important" or "very important." Unfortunately, the Illinois survey did not report what was considered "unimportant" in selecting a practice location.

A second part of the Illinois survey inquired of physicians who were practicing outside of Illinois why they had left. The results are shown in Table 2-3. Environment is not only a new factor to add to the list of preferences in considering a practice location, but also had a high subjective importance. The professional and training opportunities appear to be more prominant, at least among those who left Illinois. Some of the deterministic elements previously reported in Table 2-2 are repeated in Table 2-3. "Returning to home state," and "never meant to stay in Illinois" were important to some physicians who left Illinois.

The Illinois survey supports what *a priori* judgment would indicate, i.e., the Weiskotten account of how a physician chooses a practice location is much too simple. But the Illinois survey did not support Weiskotten in the need to consider the institutional factors (internship, residency and medical school), which are considered important by at least some physicians.

Except for some very recent studies, most of the economic analyses of physician location have not considered the institutional history of the physician stock. Rimlinger and Steele[6] (hereafter referred to as R. and S.) make some comparisons of the distribution of physicians in the U.S. in 1950 and 1959. Their analysis indicates that physician distribution is a dynamic process, reacting to or

[6] G. V. Rimlinger and H. B. Steele, "Income Opportunities and Physician Location Trends in the U.S.," Western Economic Journal, Spring 1965, pp. 182-194.

TABLE 2-3

Primary Reason for Leaving Illinois

Reason for Leaving	Percentage
Environment[a]	27.7%
Specifically Critical of Chicago	3.3
Professional Opportunities	16.7
Medical School Appointments	2.2
Training Opportunities	14.0
Left for Internship	(5.6)
Left for Residency	(5.6)
Other Training	(2.8)
Returned to Home State to Practice	9.9
Family Preference was Another State	9.6
Military Obligations	7.1
Never Meant to Stay in Illinois	4.4

[a]This represented a combination of factors: climate, dirt, air pollution, crime, etc.

SOURCE: Board of Higher Education, State of Illinois, Education in the Health Fields, June 1968, Vol. II, Part IV, p. 36.

moving with changes in their income opportunities as the demand for their services changes. R. and S. show that population changes and the degree of urban concentration are important to an analysis of physician location. Per capita income and physicians' income (a scarce and unreliable piece of data) do not show as strong a statistical relationship as would be expected on *a priori* grounds. Finally, R. and S. make a good case for concentrating on the location behavior of the recent graduates because an area's change of physician supply occurs by the addition of new doctors and the retirement or death of older practitioners.

A second generation economic study of physician location was a broad analysis of cross-sectioned state data by Benham, et.al. for four decennial census years beginning in 1930.[7] Their research employed extensive data and many regressions (52 regression equations for M.D. location alone were presented).

In summary, Benham showed that the market for physicians does seem viable, so that over time the movement of physicians has been to follow demand. There have been strong and persistent movements of physicians with changing population, and some indications of prices and incomes adjusting accordingly. The effects of urban life, training facilities (number of medical school enrollees in the state) and barriers to movement (state licensing) on physician location are not so clear. Urban life more than likely has a positive effect on the local supply of physicians, while the effect of training

[7] L. Benham, L. Maurizi and M. W. Reder, "Migration, Location and Remuneration of Medical Personnel: Physicians and Dentists," The Review of Economics and Statistics, August 1968, pp. 332-47. (Hereafter referred to as Benham.)

facilities is much more tentative.

In comparison to Weiskotten's work, the Benham model is much more aggregative, with only the slightest reference to the biographic individualities. There is no attempt to trace longitudinal patterns, but contrary to Weiskotten, there are some formulations of positive economic models which certainly have a more complete and consistent basis for physician behavior.

Benham worked with undergraduate medical enrollees only, and did not consider graduate opportunities which Weiskotten felt to be more significant than undergraduate medical school. The elasticity of medical manpower supply with respect to medical school enrollees was generally inelastic, although Benham readily admitted the uncertainty of such measurement.

An elegant and sophisticated econometric model of physician supply was a Ph.D. dissertation by Frank Sloan completed at the time Benham, et.al.'s work was published.[8] The research on the spatial distribution of physicians was principally an 8-equation simultaneous model of physician supply, although two other auxiliary equations were also estimated. Some of Sloan's conclusions were:

1. The state lacks an incentive to support medical students as these students are likely to leave the state after graduation "since interstate mobility is much too great for these policies to succeed."[9] This was a result of the Comparison of elasticities from two different equations.

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[8] Frank A. Sloan, Economic Models of Physician Supply (unpublished Ph.D. dissertation), Cambridge, Mass.: Harvard University, 1968. Sloan's research covered numerous aspects of medical education, including two chapters (7 and 8) on the spatial distribution of physicians.

[9] Ibid., p. 378.

The first elasticity was a measure of the relationship between state residents going to medical school (anywhere in the U.S.) and the location choice of new graduates. The second elasticity was a measure of the effect public medical school enrollments have on the number of state residents going to medical school.[10]

2. Using the reduced form of the 8-equation model, Sloan concludes that medical education centers (his measure was the sum of undergraduate and graduate medical students in the state) can have substantial positive effects on the local supply of physicians.[11] This would be consistent with the notion that the medical education centers provide an "environment" that is attractive to young practitioners. Sloan hypothesized that the effect may be due to residency and internship programs and/or continuing education programs. His model was unable to separate these different effects.

Conclusions 1 and 2 are subtle and deserve repetition: if state residents go to medical school (not necessarily in their home state), they are likely to practice outside their home state; but if there are medical education facilities in a state (including medical schools), then physicians (not necessarily state residents) will be attracted. Although these results are not quite contradictory, further research on these issues is warranted.

To provide more physicians, Sloan concludes that states should

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[10] A similar low elasticity for the change in physicians/population with a change in medical students/population was found using the physician supply equation. Ibid., pp. 359, 394. However, the medical students/population variable was the number of students in a 5-year period, while the physicians/population variable was a measure of the entire stock of physicians at one point in time. Since the physician stock reflects an accumulation process of 40 years, it would be surprising for the number of medical students in 5 years to have a dramatic effect on the stock. In addition, the stock variable includes foreign-educated physicians which are about 15 percent of the total, further weakening the expected effect from the U.S. medical student variable.

[11] Ibid., p. 402.

support medical education centers, but not necessarily for state residents.[12] Whether graduate or undergraduate programs or both are effective is not ascertained.

The Fein and Weber study[13] for the Carnegie Commission also used economic models to explain the location behavior of recent graduates. Using the flows of gross numbers of new physicians, Fein and Weber generally concluded that local medical schools' production does not have a significant impact on the numbers of new physicians locating in a state. Their findings imply that more fundamental forces such as the growth in population and changes in per capita income are the major economic forces allocating physicians. Their study also showed a negative correlation between the number of physicians from out of state schools in a state and the number of local graduates. This is parallel to a concept that will be developed at great length in Chapter 5. How sensitive is the in-migration of physicians to local production?

Sloan and Yett are currently conducting a series of studies on physician migration under a contract from the Department of Health, Education and Welfare.[14] Their preliminary findings on the relationship between local medical school graduates and the stock of local physicians contradicts the general theme of the previous Sloan (1968) study

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[12] Actually a subsidy program to physicians would cost less (provided discrimination between physicians in the state and potential entrants were possible) although the benefits of medical centers are more than just attracting physicians to the state. Ibid., pp. 396-404.

[13] R. Fein and G. I. Weber, Financing Medical Education--An Analysis of Alternative Policies and Mechanisms, New York: McGraw Hill, 1970.

[14] D. E. Yett and F. A. Sloan, "Analysis of Migration Patterns of Recent Medical School Graduates," No Date (Mimeographed).

and the Fein and Weber analysis. Although no numeric estimates are given, Sloan and Yett generally conclude that there are significant returns to a state (in terms of additional local physicians), which finances medical education. This is especially true, according to Sloan and Yett, when states are successful in having graduates of local schools complete other elements of their training in the same state. In effect, what Sloan and Yett have measured is the probability of retaining certain categories of physicians in the state. What they do not consider is whether one of the costs of local graduates staying in the state is the foregone imported graduate who chooses another market to sell his services.

Sloan and Yett also conclude that there is a substitution effect between teaching institutions and local physicians. They do not, however, provide any empirical verification of this.

Starting with the Weiskotten analysis where institutional considerations were paramount, the literature has made a complete circuit. Several studies have been cited which stressed the importance of more fundamental economic and demographic forces. Now with the Sloan and Yett study, there is something of a return to the institutional setting but with some consideration of economic and demographic forces.

A survey of physician reasons for selecting a place of practice provided a model of the physician as a rational economic and professional man. Economic, environmental, professional and deterministic factors were cited as being important or very important in choosing a place to practice. The economic models provided to explain physician movement have shown that population change, per capita income and physician income are major forces affecting the

flow of physicians. The institutional and professional forces cited have included places of medical training and opportunities for professional development. The model of Chapter 5 will be based on these factors and will attempt to resolve some of the conflicting studies presented so far.

CHAPTER 3

POPULATION AND PHYSICIAN MIGRATION

Practically every study on physician location has concluded that population change is an important variable in the location patterns of new physicians.[1] Where there is a growing population, there are new physicians; changes in the stock of physicians are highly correlated with changes in population. This phenomena is, of course, entirely consistent with a demand analysis for medical care.

This relationship of physician location patterns and population changes has generally been a cross section approach, i.e., growth in the stock of physicians compared with the growth in population. Rimmlinger and Stelle suggest that for future research population change should be broken down into its component parts of natural increase and migration. Yett and Sloan did use a form of migration rates as an explanatory variable. However, there has been very limited research on the migration of physicians *per se* and how this compares to the overall population migration.

A priori reasoning would suggest that the migration of physicians should be similar to the migration of the population as a whole, and especially of white males. One would expect to find that places with declining population, e.g., middle west, are also losing physicians. Whatever complex economic and social forces are causing population to move out of certain areas and into others would presumably exert

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[1] See Chapter 2.

similar influences on physicians.

The Net Migration of Physicians

The data available for this project are not complete enough to measure physician migration in the same form as the census of population. This is because the data do not include information on where a physician's residence (home) was prior to going to medical school.[2] There is a proxy for place of residence, which for some of the graduates is reasonably accurate. Public medical schools have historically followed a policy of having a discriminatory admissions policy in favor of state residents. For example, for the entering classes of 1959-60 through 1961-62 (three years), 87.5 percent of the students in public medical schools were listed as residents of the state where the medical school was located. For private medical school students, the corresponding figure was 46.9 percent.[3]

Using state of medical school as point of departure, and state of practice in 1971 as termination point, we can calculate the resultant migration inbetween. The flows of public school students

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[2]Although the data include place of birth, as will be discussed in detail later, this can cause substantial error if used as a proxy for place of residence.

[3]Source: Journal of The American Medical Association, Vol. 174, No. 11, November 12, 1960, p. 1449; Vol. 178, No. 6, November 11, 1961, p. 640; Vol. 182, No. 7, November 17, 1962, p. 795. Since there are economic incentives for public medical school students (lower tuition) to become state residents or to falsify state of residence, we can presume that this number is not unbiased. The magnitude of the bias is unknown, however.

will be more accurate, but the results for private school graduates are also shown for comparison.

"Net migration" and resultant rates of migration for the 1955-1965 graduates of U.S. medical schools are shown in Table 3-1. The unit of analysis is the census division.

Public School Graduates. There is a general migration westward shown by the substantial positive net migration to the Mountain and Pacific states. The Mountain states had a net gain of 0.8 physicians for each physician who graduated from a local medical school. Correspondingly, the Pacific states had a net gain of 1.4 physicians for each physician graduating from a local public school.

The only other division which experienced anything similar was New England with a net gain of 0.9 physicians for each physician graduating from a local public medical school. New England has only one public medical school (University of Vermont), but there are several private schools in New England. Therefore, the high net migration rate to New England should be somewhat tempered with the realization of just how small the base is (257 physicians), for the eleven-year period.[4]

The South Atlantic states show a slight positive net migration (4.3 percent) while all the Central states, both North and South, experienced substantial negative net migration. The West North Central states had the highest net losses, 31.1 percent. It might be noted that this division had both the highest total graduates per

[4]It should be noted again that the emphasis of this paper is on non-federal, non-academic, non-training physicians providing patient care.

TABLE 3-1

"Net Migration" (from Medical School to Place of Practice) of the 1955-1965 Graduates of American Medical Schools by Control of School and by Census Division[a]

Division of Graduation	Public School Graduates			Private School Graduates			Public & Private School Graduates		
	"Net Migration"	Local Production	Net Migration as a % of Local Production	"Net Migration"	Local Production	Net Migration as a % of Local Production	"Net Migration"	Local Production	Net Migration as a % of Local Production
New England	257	294	87.1%	228	2,227	10.2%	482	2,521	19.1%
Middle Atlantic	- 195	1,941	-10.0	-2,027	8,385	-24.2	-2,218	10,326	-21.5
East North Central	-1,612	5,812	-27.7	-1,026	4,141	-24.8	-2,638	9,953	-26.5
West North Central	-1,027	3,306	-31.1	- 699	1,831	-38.2	-1,723	5,137	-33.5
South Atlantic	152	3,559	4.3	- 337	3,936	- 8.6	- 185	7,495	- 2.5
East South Central	- 520	2,253	-23.1	- 362	1,474	-24.6	- 882	3,727	-23.7
West South Central	- 350	3,859	- 9.1	- 239	1,428	-16.7	- 586	5,287	-11.1
Mountain	716	891	80.4	1,010	0	b/	1,732	891	194.4
Pacific	2,579	1,827	141.2	3,452	1,526	226.2	6,014	3,517	171.0

NOTE: Correlation coefficient between public and private net migration is 0.87.

TABLE 3-1 (continued)

[a]Based on the population of physicians, as of April 1971. Excluded are physicians in training, in federal service, in administration, doing teaching and research and having the following professional addresses: foreign countries, Puerto Rico, the Virgin Islands and Pacific Islands. Net migration is defined as "in" minus "out" migration. Net migration rate is defined as the ratio of net migration to local production.

[b]There are no private medical schools in the Mountain census division.

population ratio and the highest public graduate per population ratio in 1968 (Table 1-5).

Private School Graduates. There are several similarities and differences between the net migration of the private and public school graduates (correlation coefficient $r = 0.87$). Again the obvious net migration to the western states should be noted. There were 2.3 net migrant physicians (from private schools) to the Pacific states for each local private school graduate, and over 1,000 private school graduates to the Mountain states. Since there are no private schools in the Mountain states, the net migration rate is not defined in this case.[5]

Although New England has substantial local production of private school graduates, there was still positive net migration of physicians. Of the remaining six divisions, all but the South and Middle Atlantic (North and South Central states), there was a very close correspondence of the net migration rates for the private and the public school graduates. In these four divisions the net migration was negative.

In terms of net migration, only the South Atlantic division had a different sign for private graduates (negative, which implies more flowed out than flowed in) than for public graduates (positive). This is probably a result of several private schools in Baltimore and Washington, D.C. which cater to a national market in the selection of students.[6]

When the public and private graduates are aggregated together,

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[5] It should be noted that all the private medical schools in the West (both the Pacific and Mountain divisions) are in California. These are Loma Linda, University of Southern California, and Stanford University.

[6] Johns Hopkins, Georgetown, George Washington and Howard.

it can be seen that New England and the West (both Mountain and Pacific divisions) are the net gains at the expense of the other divisions. Again the West North Central has the largest net loss, 33.5 percent; while the Mountain states have the largest net gain, 194.4 percent.

Although New York state has several public medical schools, most of the medical education in the Middle Atlantic states is private, and there is a substantial negative net migration for the division as a whole.

The Net Migration of Physicians to the Pacific Division

Net migration as a statistic presents a simplified and easily understood result of substantial flows in both directions.[7] However, net migration may not reveal as many aspects of a situation as could be desired (for example, the source of the migrants). One answer to this problem would be to calculate net migration to a particular destination, i.e., the net migration between some division and the rest of the divisions.

Since there are nine divisions, this approach could lead to nine different sets of net migration, i.e., the exchange between each division and the rest of the divisions. However, since the Pacific division is such a large importer, it will be selected as the case in point. Shown in Table 3-2 are the "net migration" rates for recent medical school graduates between eight census divisions and the Pacific division. "Net migration" is the flow

[7] See pages 1 through 7 as an example of the magnitude of the in-, out- and net migration.

TABLE 3-2

"Net Migration" (from Medical School to Place of Practice) between Eight Census Divisions and the Pacific Division for the 1955-1965 Graduates of American Medical Schools by Control of School[a]

Division of Graduation	Public School Graduates			Private School Graduates			Public & Private School Graduates		
	"Net Migration"	Local Production	Net Migration as a % of Local Production	"Net Migration"	Local Production	Net Migration as a % of Local Production	"Net Migration"	Local Production	Net Migration as a % of Local Production
New England	- 16	294	- 5.4%	- 306	2,227	-13.7%	- 321	2,521	-12.7%
Middle Atlantic	- 234	1,941	-12.1	-1,132	8,385	-13.5	-1,362	10,326	-13.2
East North Central	-1,026	5,812	-17.6	- 859	4,141	-20.7	-1,885	9,953	-18.9
West North Central	- 665	3,306	-20.1	- 481	1,831	-26.3	-1,143	5,137	-22.3
South Atlantic	- 180	3,559	- 5.1	- 459	3,936	-11.7	- 639	7,495	- 8.5
East South Central	- 94	2,253	- 4.2	- 145	1,474	- 9.8	- 239	3,727	- 6.4
West South Central	- 245	3,859	- 6.3	- 150	1,428	-10.5	- 392	5,287	- 7.4
Mountain	- 119	891	-13.4	0	b/	b/	- 33	891	- 3.7

NOTE: Correlation coefficient between public and private net migration to the Pacific division is 0.93.

[a]Based on the population of physicians as of April 1971. Excluded are physicians in training, in federal service, in administration, doing teaching and research and having the following professional addresses: foreign countries, Puerto Rico, Virgin Islands, and Pacific islands. "Net migration" is defined as the number of physicians flowing

Table 3-2 (continued)

from the Pacific division to the division in question minus the flow from the listed division to the Pacific division.

[b]There are no private medical schools in the Mountain division.

between graduation and practice from the Pacific division to division i, minus the flow from division i to the Pacific. A negative "net migration" (which happens to be the case in all instances) implies that the Pacific division "received more than it gave."

In terms of public school graduates, the Pacific division received most heavily from the midwest, both in absolute numbers and as a percent of local production. For the West North Central, the net exchange was 20.1 percent of local production, and 17.1 percent for the East North Central division. The figures for private school graduates from the midwest are not substantially different. (For all divisions except the Mountain division, the correlation between the public and private net migration to the Pacific is 0.93.)

The Pacific division is also a net gainer with the Mountain states[8] receiving a net number of physicians equivalent to 13.4 percent of the Mountain division production.

The Pacific division has substantial net migration from the Middle Atlantic states in both public and private school graduates, and in terms of Middle Atlantic production, about the same percentage (approximately 13 percent). However, in absolute numbers the private school graduates predominate, 1,132 versus 234 for the public graduates.

Although New England shows a net loss to the Pacific division of 5.4 percent public school graduates, this is based on a relatively small absolute number (15 - 31 = 16). The 306 net private school "migrants" from New England to the Pacific division is more substantial.

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[8]The Pacific division is the only case where the Mountain division "gives more than it receives." In all other cases, the Mountain states "receive more than they give," and it should be recalled from Table 3-1 that overall the Mountain states are substantial gainers.

The net exchange of public graduates between the Pacific division and the southern divisions shows a slight advantage in percentage terms for the Pacific states. In absolute numbers, however, the loss of 245 physicians from the West South Central is quite substantial. In all the southern divisions, the net loss (in percentage terms) of private school graduates to the Pacific division is greater than the net loss of public school graduates.

When the public and private school graduates are aggregated together, the principle supplier of net migrant physicians to the Pacific division has been the Middle Atlantic and midwestern states. Of the southern divisions, the South Atlantic has had the largest net losses to the Pacific states, although the losses are substantially less than for the eastern and midwestern states.

For the reader interested in more detail of the flows of physicians, Appendix 1 contains tables on both the rates of out and net migration between all divisions for both public and private school graduates.

White Male Migration and Physician Migration

The physician population is predominantly white male in its composition[9] and a principle variable in the demand for medical care is population. Furthermore, before the recent advent of substantial government involvement in the financing of medical care, it has generally been conceded that income of the population is another important factor in the demand for medical care. A reasonable *a priori* statement

[9]For the physicians in our sample, 94.3 percent are male.

then, is to assume that the migration of physicians and white males should be somewhat similar. Similar because physicians are a subgroup of the white male population, and because the white population (male and female) is a principle source of demand for physician services.[10]

This section will provide a comparison of the migration of white males and recent graduate physicians. It will be shown that physician migration is very similar to the migration of total white males, but substantially different than another group of white males, namely those age 25-29 with four or more years of college education.

Table 3-3 compares the "net migration" of recent medical school graduates to the net migration of white males. The data for the recent graduates are the same as that in Table 3-1, while the net migration of white males is from the 1960 census and is based on the movement between 1955 and 1960.

The net migration of white males age 25-29 with four or more years of college is shown, in addition to the data for all white males. Comparison of net migration for physicians and for white males shows similarities and differences. Although there is a scale difference, all the divisions, except New England, have the same sign on net migration for physicians as for the total white male population. While New England has more in-migrant than out-migrant physicians, for total white males, the reverse is the case.

The general movement of physicians westward is paralleled by the movement of white males westward. The Pacific and Mountain divisions have the only positive net migration rates for white males

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[10] The migration of white males and females could have been used with no substantial differences because of the high correlations between the white male and female population movements.

TABLE 3-3

The "Net Migration" of 1955-1965 Graduates of American Medical Schools Compared to the Net Migration of White Males between 1955 and 1960 by Census Division[a]

Division of: Graduation (Physicians) 1955 Residence (White Males)	Net Migration of Physicians as a % of Local Production[b]			Net Migration of White Males as a Percent of 1960 Cohorts	
	Public	Private	Total	Age 25-29 With 4 or More Years of College Education	Total[d]
New England	87.1%	10.2%	19.1%	- 8.9%	-0.8%
Middle Atlantic	-10.0	-24.2	-21.5	0.1	-2.3
East North Central	-27.7	-24.8	-26.5	2.7	-1.7
West North Central	-31.1	-38.2	-33.5	- 5.3	-2.9
South Atlantic	- 4.3	- 8.6	- 2.5	- 2.0	-6.6
East South Central	-23.1	-24.6	-23.7	-14.4	-1.9
West South Central	- 9.1	-16.7	-11.1	- 9.5	-0.8
Mountain	80.4	e/	194.4	- 4.4	3.8
Pacific	141.2	226.2	171.0	17.6	5.8

NOTE: Correlation coefficient between the net migration of public and private physicians is 0.87. Between the net migration of total white males and white males with 4 or more years of college, r=0.49.

[a] "Migration" of physicians as used here is between division of graduation and division of practice. Net is "in" minus "out" migration.

[b] See footnote Table 3-1 for source and qualifications.

[c] U.S. Bureau of Census. U.S. Census of Population: 1960. Subject Reports. Lifetime and Recent Migration. Final Report PC(2)-2D. Washington, D.C., 1963. Table 8.

[d] U.S. Bureau of Census. U.S. Census of Population: 1960. Subject Reports. Mobility For States and State Economic Areas. Final Report (PC(2)-2B Washington, D.C., 1963. Tables 25 and 26; U.S. Bureau of Census, Statistical Abstract of the United States: 1965. (86th edition). Washington, D.C., 1965, p. 27.

[e] There are no private medical schools in the Mountain Census Division.

with the former being greater than the latter. While the net migration of white males from the midwest is in the same direction as physicians in the midwest, the relative magnitudes are not the same. The highest rate of net migration for all divisions may be found in midwestern physician graduates and white males from South Atlantic states. Furthermore, it should be observed that the physicians from the South Atlantic division generally have a low net migration rate as contrasted with the high net migration of white males.

The correlation between the net migration of total white males and white males age 25-29 with four or more years of college is only 0.49 (r^2=0.22). The similarities in the movement of these two groups is in the general movement out of the South and the midwest and the movement to the Pacific division. This somewhat parallels the movement of physicians, but there are substantial differences.

In order to test the relationship of movement of the physician population and the white male population, some simple regressions were made. Table 3-4 shows the results of regressing the physician net migration on net migration of total white males, and on the net migration of white males age 25-29 with four or more years of college. (The lower portion of Table 3-4 has the same regressions as the upper portion, but is for the net migration to the Pacific division as opposed to net migration in general. These results are discussed later.)

For the "net migration" of both total physicians (public and private) and public school graduates,[11] there is a high correlation

[11] Since the place of origin for public school graduates is known with more certainty, their migration patterns provide more reliable estimates of the "real" migration of physicians.

TABLE 3-4

Physician Net Migration as a Function of White Male Net Migration (by Census Divisions)[a]

Dependent Variable	Independent Variable	Constant	b_1	R^2
(Net Migration of...)	(Net Migration of...)	(t statistic)		
Total Physicians	Total White Males	46.39 (2.71)	20.51 (4.25)	0.72
Total Physicians	White Males Age 25-29 With 4+ Years College	42.31 (1.48)	4.78 (1.52)	0.25
Public Graduate Physicians	Total White Males	33.83 (2.39)	13.66 (3.43)	0.63
Public Graduate Physicians	White Males Age 25-29 With 4+ Years College	32.11 (1.60)	3.55 (1.60)	0.27
Total Physicians to the Pacific Division	Total White Males to the Pacific Division	- 7.11 (1.37)	4.62 (0.98)	0.14
Total Physicians to the Pacific Division	White Males Age 25-29 With 4+ Years College to the Pacific Division	-13.49 (4.42)	-0.66 (0.92)	0.12
Public Graduate Physicians to the Pacific Division	Total White Males to the Pacific Division	- 1.23 (0.38)	9.48 (3.15)	0.62
Public Graduate Physicians to the Pacific Division	White Males Age 25-29 With 4+ Years College to the Pacific Division	-10.26 (3.28)	0.09 (0.13)	0.003

[a]See Tables 3-2 and 3-3 for sources and qualifications of data.

with the movement of total white males. In the former case, the R^2 is 0.72 and 0.63 in the latter. By contrast, there is more unexplained variance between the movement of physicians and white males age 25-29 with four or more years of college. (R^2 of 0.25 and 0.27 respectively).

Net migration rates of physicians and white males to the Pacific division are shown in Table 3-5. In all cases, the signs are negative, implying that the Pacific division "receives" more than it "gives." In percentage terms, the Pacific division has the greatest exchange of both white males and physicians with the Mountain and midwestern states. The generally lower rates of net migration between the Pacific division and the southern states is true for both physicians and white males.

A simple regression of physician net migration on white male net migration to the Pacific division is shown in the bottom half of Table 3-4. The results are generally the same as for net migration overall. The correspondence of the data is better when the independent variable is total white males than when the smaller subset of white males is used, although the R^2 are generally lower than in the case of net migration overall.

In conclusion, the evidence of this chapter has shown that physician movement has high correspondence with the migration of white males. While there are some similarities between physician movement and white males of comparable ages and educational attainment, there are also substantial differences. The migration of total white males was shown to be a better predictor of physician migration than the migration of a smaller subset of white males with

TABLE 3-5

The "Net Migration" of 1955-1965 Graduates of American Medical Schools to the Pacific Census Division Compared to the Net Migration of White Males to the Pacific Division between 1955 and 1960[a]

Division of: Graduation (Physicians) 1955 Residence (White Males)	"Net Migration" of Physicians to the Pacific Division as a Percent of Local Production			Net Migration of White Males to the Pacific Division as a Percent of their 1960 Cohorts	
	Public	Private	Total	Age 25-29 With Four or More Years of College	Total[b] (All Ages)
New England	- 5.4%	-13.7%	-12.7%	-3.3%	-0.73%
Middle Atlantic	-12.1	-13.5	-13.2	-1.7	-0.68
East North Central	-17.6	-20.7	-18.9	-3.2	-1.10
West North Central	-20.1	-26.3	-22.3	-5.5	-1.82
South Atlantic	- 5.1	-11.7	- 8.5	-2.2	-0.42
East South Central	- 4.2	- 9.8	- 6.4	-1.2	-0.44
West South Central	- 6.3	-10.5	- 7.4	-3.2	-1.07
Mountain	-13.4	c/	- 3.7	-8.7	-1.58

NOTE: The correlation coefficient between the net migration of public and private graduate physicians is 0.93. Between the net migration of total white males and white males age 25-29 with four or more years of college, r=0.84.

[a]See Table 3-3 for sources and qualifications on physician movements. Source of white male movements: U.S. Bureau of Census. U.S. Census of Population, 1960. Subject Reports. Lifetime and Recent Migration. PC(2)-2D. (Washington, D.C., 1963).

[b]Native born.

[c]There are no private medical schools in the Mountain division.

socioeconomic characteristics comparable to physicians.[12]

While most studies of physician location have found correlations to population change, it is reasonable to state that this approach is not complete enough. Physician migration should be considered in the context of the substantial demographic changes occurring within the U.S.

[12]One explanation of these differences is the more uniform distribution of four-year colleges.

CHAPTER 4

INSTITUTIONAL FACTORS AND PLACE OF PRACTICE

The longitudinal approach to the location patterns of physicians was that used by Weiskotten, et.al., and Sloan and Yett.[1] This methodology employs biographic data on individual physicians. The emphasis is to determine patterns of behavior relevant to institutional considerations such as place of medical school, place of internship, place of residence, etc.

An often quoted statistic from Weiskotten's analysis is the fact that sixty-three percent of the 1950 graduating class was practicing in the same state as the state of residency training. This was higher than the percentage of graduates practicing in the same state as the state of graduation, internship or prior residence. This has led at least several public agencies to consider the location of residency programs as one of the more effective policy instruments to influence the location choices of physicians.[2] What is inherent in the Weiskotten study, but ordinarily not acknowledged in the subsequent policy analysis, is the simple fact that the places of all the institutional factors considered are not independent events, i.e., where physicians go to medical school and where they take their residency training are

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[1] See Introduction, pages 4 and 16.

[2] For example, see The Carnegie Commission on Higher Education, Higher Education and The Nation's Health, McGraw Hill Book Co., New York, 1970, p. 44. State of California, Coordinating Council for Higher Education, Medical Education in California: A Report to the California State Legislature, Sacramento, 1963. Board of Higher Education, State of Illinois, Education in The Health Fields, 1968, Volume 1.

not independent events. This chapter will attempt to clarify and update the Weiskotten analysis.

Typology of Institutional Factors

Consider state (geographic) of practice as being equal or not being equal to the state (geographic) of three other events, i.e., birth, medical school and graduate training. If a physician's state of practice is the same as where he was born, attended medical school, and received his graduate training, consider him a type "1."[3] If state of practice is the same as where he attended medical school and did his graduate training, but not where he was born, consider him a type "2," and so on. Since there are three events to be compared, with two possible outcomes for each (true, not true), there are $2^3 = 8$ possibilities. In other words, on a basis of comparing a physician's state of practice with three other institutional events, all physicians would be categorized on a nominal scale from 1 to 8. Those in category "1" might be called "stay at homes" and those at the other extreme, category "8," might be called "movers." (It should be emphasized that the scale is nominal and discontinuous.)

Graduate training as used here, refers to any of the following events: internship, residency and fellowship appointments. Although

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[3]Since physicians can and do take graduate training in more than one state, equality (true) was considered when state of practice was equal to at least one of up to four different states in the graduate training history. In other words, a list of unique states from the graduate training history of each physician was generated. Then the place of practice was compared to the entire list, and equality was accepted when the state of practice was the same as any one of the different states listed.

there is some loss in preciseness by not differentiating between these graduate education events, the reduction in the number of categories, and the subsequent improvement in comprehension was felt to be substantial enough to justify this approach. Since the number of categories increases by the power of the number of events, distinguishing between internship and residency (the most likely distinction) would have increased the number of physician categories from eight to sixteen (2^3 versus 2^4).

The loss of preciseness caused by not distinguishing between internship and residency is mitigated when the nature of the test is considered. The test was for equality of state of practice with state of any one of the states of graduate training. There is no attempt to give ordinal qualities to the test which might be the case if distinguishing between internship and residencies. Furthermore, the general decline of educational emphasis on the internship relative to the residency provides a general attitude that any policy concerned with graduate training would be better directed at the residency in any case.

The typology of eight institutional factors for the 1955-1965 graduates is shown in Table 4-1. The graduates are divided by control of school into public and private. Consistent with the general approach of this paper, federal, academic, and physicians in training are excluded.

While 35.3 percent of the public school graduates are "stay at homes" (category "1," i.e., state of practice equals state of medical school of graduation, state of graduate training and state of birth) only 21.0 percent of the private school graduates fall into this

TABLE 4-1

Typology of Institutional Factors for the State of Practice for the 1955-1965 Public and Private Medical School Graduates[a]

State of Practice = State of		Typology Factor 1	2	3	4	5	6	7	8	Total
Medical School		yes	yes	yes	yes					
Graduate Training		yes	yes			yes	yes			
Birth		yes			yes	yes		yes		
Type of Control										
Public	N	8,412	2,506	569	1,864	534	4,296	497	5,119	23,797
	%	35.3	10.5	2.4	7.8	2.2	18.1	2.1	21.5	100.0
Private	N	5,238	2,662	430	680	2,670	5,199	1,611	6,508	24,998
	%	21.0	10.6	1.7	2.7	10.7	20.8	6.4	26.0	100.0
Total	N	13,650	5,168	999	2,544	3,204	9,495	2,108	11,627	48,795
	%	28.0	10.6	2.0	5.2	6.6	19.5	4.3	23.8	100.0

[a]Based on a population of 78,424 physicians as of April 1971. Excluded are physicians in training, in federal service, doing medical teaching and research, in administration and "other" types of practice, and physicians having professional addresses other than the fifty states of the U.S. Also excluded are the graduates of the California College of Medicine.

SOURCE: Unpublished data from American Medical Association's master file on physicians.

category. This is probably a reflection of the fact that private medical school students are much more likely to go out of state to attend medical school. They thereby become more mobile and subsequently are faced with different opportunities and have a lower probability of practicing where they were born.

The equal percentage of public and private graduates in category "2" (state of practice equals state of medical school of graduation and state of graduate training) is significant. This suggests that private and public schools are equally able to create circumstances whereby a student attending an out-of-state medical school is likely to stay in that state and unlikely to return home to practice.

The higher percentage of public school graduates than private school graduates in category "4" (state of practice equals state of medical school and state of birth) is probably a reflection of the different attendance patterns of the two types of students (i.e., public schools admit more home state residents). It also suggests that public school graduates sometimes leave their home state for graduate training, but do return to practice.

Similar but somewhat different behavior of the private school graduates is shown by the high percentage of privates in category "5." This shows that private school students will attend medical school out of state, but return home for graduate training and practice.

The bimodal nature of public and private graduates in categories "4" and "5" (7.8 percent public in "4" and 10.7 percent private in "5") is but one example of the complexity of the entire process from birth to place of practice. It further illustrates there can be no

simple rules like "place of residency" is the most important factor in determining place of practice.

Category "6" represents those physicians practicing in the state where they did their graduate training, but not where they went to medical school or where they were born. Eighteen percent of the public graduates and twenty-one percent of the private graduates are in this category. Although the difference in proportion is small, given the large sample size the difference is statistically significant at an α level of less than 0.10. In effect, then, it can be seen that private school graduates are more likely to be mobile and practicing in a location where the only institutional contact they have is graduate training. However, the difference between the two groups (public and private) is very small.

Category "7" (state of practice equals state of birth only) again reflects the different attendance patterns of private and public graduates. Approximately six percent of the private graduates are "type 7's" while only two percent of the public graduates are.

Category "8" is the "cold turkeys" or "movers," i.e., physicians practicing in a state not equal to any of the states of prior institutional contact (medical school, graduate training or birth). For the entire sample, twenty-four percent are in this category, with the privates having a definitely higher representation. This is consistent with the overall picture of the more mobile private school graduates, although the publics are also well represented.

In an overall reflection of Table 4-1, it is significant just how large category "8" is. Approximately one fourth of the American graduates of the last decade are practicing in a state where they

had no prior institutional contact (as measured by the biographic sketches). It would appear that this group of physicians certainly deserves more attention in the policy analysis than they have received. These physicians give definite credence to a hypothesis that physicians are a mobile labor force that transcends traditional state boundaries in the selection of a place of practice.

Interestingly enough, the original Weiskotten analysis showed that twenty-one percent of the class of 1950 (who took at least one residency) would fit the "type 8" description. However, other than showing the number in a table, no mention is made of this group of physicians, either by Weiskotten, et.al., or the numerous reports quoting the Weiskotten findings.

Just for the record, it might be worthwhile to aggregate Table 4-1 into overly simplified but easily quoted statistics. It should be emphasized, however, that no causation is implied by this approach, nor are any policy alternatives readily deduced by the aggregation.

Shown in Table 4-2 are the distributions for the relationship of place of practice to the sum of typology factors relating to place of graduate training, medical school and birth. In other words, Table 4-2 presents answers to three simple questions:

1. How many physicians are practicing where they did their graduate training?
2. How many physicians are practicing where they went to medical school?
3. How many physicians are practicing where they were born?

There are more physicians answering yes to question one than the number answering yes to question two or three. Furthermore, there is not much difference between the proportion of public and private school graduates answering yes to question one (i.e., practicing

TABLE 4-2

Cumulative Frequency Distribution of
Factors Relating State of Practice to State
of Graduate Training, Medical School and Birth[a]

	Type of Medical School of Graduation		
	Public	Private	Total
Physicians Practicing in State of Graduate Training[b]	66.2%	63.1%	64.6%
Physicians Practicing in State of Medical School of Graduation[c]	56.1	36.0	45.8
Physicians Practicing in State of Birth[d]	47.5	40.7	44.1

[a]See footnote Table 4-1 for qualifications and source.

[b]Sum of Typology Factors 1, 2, 5, 6.

[c]Sum of Typology Factors 1, 2, 3, 4.

[d]Sum of Typology Factors 1, 4, 5, 7.

where they did their graduate training). There are substantial differences, however, between the proportion of public and private graduates answering yes to questions two and three. While fifty-six percent of the public graduates are practicing in the state where they went to medical school, only thirty-six percent of the privates live in the same state as their medical school. There is a similar split, but not as great a difference, in the proportions answering yes to the state of birth question.

The significance of the differences between the proportion of public and private graduates practicing in the state of their medical school is diminished when consideration is given to the differing admission policies. Since private schools select substantially fewer home state residents than public schools, we would expect to find a difference in the practice locations.

The seven percent difference between public and private graduates practicing in the state of birth is by no means minor, but is still close enough to suggest that private school graduates also have a tendency to practice in their home state.

A Direct Comparison of Typology Approach with the Weiskotten Analysis

Besides the difference in the aggregation of internship and residencies into one category, there is another difference between the typology factor approach of the last few sections and the approach of Weiskotten, et.al. In the typology approach, the state of birth was assumed to be equal to the state of residence before attending medical school, while Weiskotten's analysis was based on a survey

which asked the residence question directly.[4] The use of state of birth as place of prior residence is less than ideal since the possibility exists that individual physicians were young migrants which would imply that state of birth was not equal to state of residence. The error resulting from this assumption will be discussed in detail later in this chapter.

A comparison of the typology display with the Weiskotten results (arranged to reflect the typology approach) would provide a general verification of the former approach. The Weiskotten and typology results are shown in Table 4-3. Weiskotten's data are for the class of 1950 in "private practice" who had at least one residency. In an effort to present data comparable to the Weiskotten data, non-General Practice physicians of the classes of 1955-1957 whose employment was comparable to "private practice" were selected for comparison. Also shown in Table 4-3 is a projection of the 1950 class to 1956 (comparable to the average of the 1955-57 classes) based on the distribution of the 1950 class and the rate of change between 1945 and 1950. With a few exceptions, the overall pattern of the author's topology categories is generally consistent with the rearranged Weiskotten data.

One of the principle differences between the author's data and the rearranged Weiskotten results is with categories "1" and "2." As can be seen in Table 4-3, the author's category "1" is substantially lower than Weiskotten's category "1" (26.2 versus 32.1 for Weiskotten

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[4] It should be noted that Weiskotten's survey did not include a definition of "place of residence before entering medical college" and the possibility of differing interpretations by different respondents exists. Weiskotten, et.al., op.cit., p. 1085.

TABLE 4-3

A Comparison of the Typology of Institutional Factors for the 1955-1957 Graduates with Weiskotten's Previous Study of the 1950 Graduates[a]

State of Practice = State of (Medical School / Graduate Training / Birth/Prior Residence (see note 2))		Typology Factor 1	2	3	4	5	6	7	8	Total
		yes / yes / yes	yes / yes	yes	yes / yes	yes / yes	yes	yes		
Class of 1950 (Weiskotten's Data)	%	33.8	4.6	0.7	4.3	11.6	18.8	5.5	20.7	100.0
Class of 1950 Projected to 1956 (Weiskotten's Data)[b]	%	32.1	5.7	0.8	4.5	11.9	21.4	3.8	19.1	100.0
Class of 1955-57 (Author's data)	%	26.2	9.4	1.3	4.0	7.0	21.3	4.7	26.1	100.0

NOTES: 1. Class of 1950 is for "private practice" physicians who took a residency. Classes of 1955-57 is for non-General Practice physicians excluding those in training, federal service, administration, teaching and research and those with foreign addresses.

2. Prior residence was the test element for the class of 1950. Birth was the test element for the classes of 1955-57.

[a]H.G. Weiskotten, W.S. Wiggins, M.E. Altendorfer, M. Gooch and A. Tipner, "Trends in Medical Practice--An Analysis of the Distribution and Characteristics of Medical College Graduates, 1915-1950," The Journal of Medical Education, Vol. 35, No. 12, December 1960, p. 1088.

[b]Projection is the percentage distribution for the class of 1950 projected to 1956 based on a linear trend of the change between the classes of 1945 and 1950.

projected) while the author's category "2" is substantially higher than Weiskotten's. The sum of category "1" and "2" however is fairly close in both examples (35.6 [author's] versus 37.8 [Weiskotten]). One explanation of this phenomena is the error in the author's data caused by the use of state of birth as a proxy for place of residence. In effect, many physicians who are in category "2" (place of practice equals place of medical school and graduate training) should be in category "1" (place of practice equals place of medical school, graduate training and prior birth/residence). This would be the case, for example, in California where there is a high probability that young persons residing in California were born elsewhere. T these young persons went to a California medical school and t their graduate training in California and are practicing ir then they should be in category "1" but are actually in Although this is a noble assumption regarding the dif the errors of the two estimates, it is only fair t one of many possible explanations.

Later analysis (Chapter 5) will be of migrants, category "6" ("graduate practice equals state of graduate turkey migrants"; state of pra institutional variables). T category "6" with the Weiskotten pre versus 21.4 percent). There is some discrepancy, however, in

[5]For all non-federal, non-academic physicians practicing in California, 13.1 percent are category "2" while the national average is 10.5 percent in category "2." Furthermore, for forty-eight states (excluding Alaska, Hawaii and Washington, D.C.), the correlation coefficient between the percent in category "1" and category "2" is 0.78 ($r^2 = 0.61$).

category "8," where the author's data are approximately six percent greater than the Weiskotten projected data. Part of this difference can probably be credited with the general increase in mobility of the population over time, but it seems reasonable to assume that at least part of it is the error in the state of birth variable.

Migrants will be defined as those physicians practicing in a state different than their state of birth. This definition would include those physicians in categories "2, 3, 6 and 8." As was explained above, it will be assumed that many physicians in category "2" should be in category "1." Category "3" is only two percent of the physicians (see Table 4-1), while category "6" and "8" account for forty-three percent of the recent graduates. Since category "3" is such a small percentage of the total, it will not receive emphasis in the following analysis. The bulk of the material in Chapter 5 will be concerned with the graduate training migrant and the "cold turkey" migrant.

Geographic Differences in the Typology of Institutional Factors

The previous section showed a general agreement in the typology of institutional factors and the Weiskotten results. This section will show that although there is agreement in the aggregate, significant differences are very apparent when the data are disaggregated. Therefore any discussion of the distribution of physicians should recognize the substantial differences underlying the overall aggregates.

The typology of institutional factors for the state of practice

is displayed by division of practice in Table 4-4.[6] As can be readily seen, there are substantial differences in different geographic areas. For the reader interested in more detail, Appendix A-2 has the state-by-state compilation of institutional factors.

The data in Table 4-4 is a complex mosaic of the sources of physicians. It is not the purpose of this section to provide a long narrative of all the differences, instead a short summary of some of the highlights will be provided:

The Middle Atlantic, East North Central, and West South Central states educate substantial numbers of their own physicians. While the national average for category "1" is 27.3 percent, these three divisions have in excess of 40 percent of their physicians in this category.

Both New England and the Middle Atlantic states have substantial numbers of their residents leave their state for medical school but return for graduate training and practice. While the national average for category "5" physicians is 6.6 percent, both these divisions have two times the national average in category "5."

The western states import most of their physicians after medical school. While the Mountain states import most of their physicians after graduate training, the Pacific states import most of theirs at time of graduate training.

The percentages of physicians in categories "6" and "8" show tremendous variance, even though the total averages are substantially equal to the Weiskotten aggregates.

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[6] The actual comparisons are made on a state-by-state basis. However for ease of display, the distributions are aggregated to the Census division level. It should be noted that the slight differences in the aggregates between Tables 4-1 and 4-4 is because Table 4-4 includes Canadian graduates practicing in the U.S. and the 1963-65 graduates of the California College of Medicine (U.C.Irvine), while Table 4-1 does not.

TABLE 4-4

Typology of Institutional Factors for State of Practice for the 1955-1965 Graduates of American Medical Schools by Division of Practice[a]

State of Practice = State of Medical School Graduate Training Birth		TYPOLOGY FACTOR 1 yes yes yes	2 yes yes	3 yes	4 yes yes	5 yes yes	6 yes	7 yes	8	Total
DIVISION OF PRACTICE										
New England	N	416	269	69	76	417	773	220	939	3,179
	%	13.1	8.5	2.2	2.4	13.1	24.3	6.9	29.5	100.0
Middle Atlantic	N	3,447	735	65	202	1,224	1,111	398	1,167	8,349
	%	41.3	8.8	.8	2.4	14.7	13.3	4.8	14.0	100.0
East North Central	N	3,029	834	133	419	464	1,238	234	1,178	7,529
	%	40.2	11.1	1.8	5.6	6.2	16.4	3.1	15.6	100.0
West North Central	N	941	371	119	320	198	606	212	722	3,489
	%	27.0	10.6	3.4	9.2	5.7	17.4	6.1	20.7	100.0
South Atlantic	N	1,565	818	214	508	248	1,403	328	2,315	7,399
	%	21.2	11.1	2.9	6.9	3.4	19.0	4.4	31.3	100.9
East South Central	N	1,033	269	83	357	104	182	245	583	2,856
	%	36.2	9.4	2.9	12.5	3.6	6.4	8.6	20.4	100.0
West South Central	N	2,077	640	119	425	109	467	144	754	4,735
	%	43.9	13.5	2.5	9.0	2.3	9.9	3.0	15.9	100.0
Mountain	N	177	117	30	76	83	534	189	1,465	2,671
	%	6.6	4.4	1.1	2.8	3.1	20.0	7.1	54.8	100.0
Pacific	N	1,015	1,203	172	163	494	3,841	197	2,964	10,049
	%	10.1	12.0	1.7	1.6	4.9	38.2	2.0	29.5	100.0
Total	N	13,700	5,256	1,004	2,546	3,341	10,155	2,167	12,087	50,256
	%	27.3	10.5	2.0	5.1	6.6	20.2	4.3	24.1	100.0

[a]Based on the 1955-1965 graduates of U.S. medical schools (and 1,711 Canadian graduates in the U.S.). Excluded are physicians in federal service, in training, doing medical research and/or teaching, doing administrative work and "other" types of practice. Also excluded are physicians with professional addresses in other than the fifty states of the U.S., and the 1962 graduates of the California College of Medicine.

Further detail in the ent of the differences in categories "6" and "8" can be found in Table 4-5. As was explained at the end of the last section, the principle purpose of the next chapter will be to examine the movement of these physicians from state to state.

Other Estimates of the Error Resulting from the Assumption that State of Birth Equals State of Prior Residence

The comparison of the typology approach with the Weiskotten data in the previous section included a discussion on the error resulting from the state of birth variable. This section will present some other data relevant to the question of error resulting from the place of birth variable.

Census Data. A comparison of place of birth with place of residence in 1960 for native whites in selected age groups is shown in Table 4-6. These data are from the 1960 census, and are presented by divisions and region, for the closest cohorts to recent graduate physicians as the published census contains. Two similar but distinctly different forms of the data are shown for three age groups. The left side of Table 4-6 is the percent of persons born in that region (division) who are living elsewhere. The right side of Table 4-6 shows the percent of individuals living in a region (division) who were born elsewhere. A hueristic interpretation of this data would be:

left side = "the probability that persons born in a particular place will have moved out by 1960."

right side = "the probability that persons living in a place in 1960 were born elsewhere."

TABLE 4-5

Percent of Recent Graduate Physicians in Categories "6" (Intern-Resident Migrant) and "8" (Cold Turkey Migrants) for Selected States[a]

State	Category "6"	Category "8"
Massachusetts	24.6%	17.4%
Connecticut	26.6	40.4
New York	14.9	6.3
New Jersey	12.2	46.0
Illinois	10.6	16.5
Michigan	24.1	8.4
Nebraska	2.4	11.0
North Carolina	12.4	25.0
Florida	35.4	34.4
Texas	12.1	17.9
Colorado	33.9	35.8
Arizona	22.9	67.1
California	40.7	27.7
U.S.	20.2	24.1

[a]For source and qualifications, see Table A-2 in Appendix A-2. Category "6" implies that state of practice equals at least one of the states of graduate training, but state of practice does not equal state of birth or state of medical school. Category "8" implies that state of practice does not equal state of birth, medical school or graduate training.

Several trends in Table 4-6 are distinct. The difference between place of birth and place of residence:

1. Increases with age, especially in the 15-19 year olds.
2. Increases with decreasing levels of aggregation.
3. Has an asymmetrical relationship between places which have historically had positive net migration and places with negative net migration.

The third point requires further explanation. For places which have had substantial out-migration, e.g., West North Central division, the differences on the left side of Table 4-6 are relatively large while the differences on the right side of the table are small. The reverse is the case for places with a history of substantial in migration, e.g., Pacific division. As a result it can be said that for persons living in the Pacific division, their place of birth is relatively uncertain (birthplace is a poor predictor). But for persons born in the Pacific division, place of birth is a good predictor of place of residence. The opposite is the case for persons from the midwest, i.e., for persons living in the midwest, it can be accepted with relative confidence that they were born there, but place of residence for persons born there is not so certain.

Although the data in Table 4-6 provide an estimate of the magnitude of the error in the place of birth variable, realistically, it should be recognized that the group of cohorts selected (native white males) is too broad to provide anything more than a most general estimate.

Besides the obvious socioeconomic differences between the native white males and physicians, other specific objections to the data in Table 4-6 include:

TABLE 4-6

Relationship of Place of Birth to Place of Residence
for Native Whites by Selected Age Groups in 1960

Region (Division)	Born in the Specified Region (Division) but Living in Other Regions (Divisions)			Living in the Specified Region (Division) but Born in Other Regions (Division)		
	Age			Age		
	10-14	15-19	20-24	10-14	15-19	20-24
Northeast	8.1%	10.9%	16.1%	4.0%	5.0%	7.0%
New England	10.9	13.2	19.4	7.5	11.3	17.7
Middle Atlantic	9.4	13.3	19.5	5.1	6.2	8.3
North Central	10.1	13.4	20.0	8.0	10.0	13.8
East North Central	10.2	13.8	19.8	10.2	12.6	18.6
West North Central	16.1	20.4	31.4	9.7	12.9	16.6
South	10.4	13.1	18.9	8.7	10.9	15.2
South Atlantic	11.5	13.7	18.0	15.1	18.8	27.4
East South Central	19.0	22.7	35.4	9.2	12.2	15.9
West South Central	14.2	19.3	27.0	11.7	14.1	19.3
West	8.3	9.5	10.3	21.4	29.1	42.8
Mountain	20.9	26.6	37.4	28.6	34.2	42.7
Pacific	11.1	13.3	12.6	25.3	35.8	53.1

SOURCE: U.S. Bureau of Census. U.S. Census of Population: 1960. Subject Reports. State of Birth. Final Report PC(2)-2A. Washington, D.C., 1963, pp. 13-16.

1. The native white male population includes military and college students which provides a positive bias to the data.
2. The majority of the native white male population in the 15-19 year age group have already entered the job market which is a significant period of increased migration. This also provides a positive bias to the data.

Assuming that medical school graduates are twenty-one years old at time of entering medical school, the classes of 1961 through 1965 would be in the 20-24 age group in 1960. If we arbitrarily select the 15-19 native white males as representative of the physician population (at time of matriculation), Table 4-6 should provide an estimate of the error in the birth variable. For the probability of having moved out (left side of Table 4-6), the maximum error would be for physicians born in the Mountain division (26.6 percent). For the probability of having been born in a division different than division of residence, the maximum error would be for medical students residing in the Pacific division (35.8 percent).

Appendix A-4 contains the comparable estimates for states (unit of aggregation) of the data on the right side of Table 4-6 (percent of native white males 15-19 living in a state but were born in another state). The difference between place of birth and place of residence increases by approximately five to ten percent when the smaller unit of aggregation (state) is used.

In conclusion, it can be said that the error in assuming place of birth equals place of residence at time of entering medical school can be very substantial (up to 45 percent). The resultant error is not constant but is dependent on the place of residence and place of birth. All of these conclusions are based on the

assumption that medical students are comparable to the native white males age 15-19 in 1960.

Published AMA Data on Source of Entering Medical Students

The Journal of The American Medical Association publishes data on the "place of residence" for each year's entering medical class. If it is assumed that attrition rates are uniform, can these data be used for comparison with the "place of birth" for the appropriate year's medical school graduates?

The published data on the source of entering students are a matrix with medical schools on one axis and state of residence on the other. Since public medical schools discriminate in favor of home state residents and because the medical schools are arranged in order of the states, the off-diagonal elements are small for public medical schools. Since most private medical schools have a more national source of students, most all cells are relatively small. Therefore the analysis was restricted to graduates of public medical schools and graduates of private medical schools which take substantial graduates from the state of the medical school. The graduates of three years (1962 to 1965) were selected as the sample. The results are shown in Tables 4-7 through 4-9.

The difference between the percent of entering students listed as home state residents and the percent of graduates listing the state of the medical school as place of birth is an estimate of the error in the birth variable. The low for public school graduates is for graduates from the University of Vermont, 0.8 percent, to a

TABLE 4-7

Percent of Entering Students Listed as State Residents in Published AMA Data and Percent of Graduates from Medical Schools in the State Listing the State of the Medical School as Place of Birth for the 1963-65 Graduates of Public Medical Schools[a]

State of Medical School	% Listed as Home State Residents in the Published AMA Data	% of Graduates from Schools in the State Listing the State as Place of Birth	Difference
Northeast			
Vermont	24.5%	23.7%	0.8%
Middle Atlantic			
New York	89.9	82.4	7.5
East North Central			
Illinois	99.0	84.6	4.4
Indiana	91.7	69.6	22.1
Michigan	84.3	68.5	15.8
Ohio	89.8	85.4	4.4
Wisconsin	90.1	69.0	21.1
West North Central			
Iowa	88.9	69.9	19.0
Kansas	86.0	59.9	26.1
Minnesota	88.6	71.0	17.6
Missouri	97.1	74.3	22.8
Nebraska	93.1	67.0	26.1
South Atlantic			
Florida	87.8	38.1	49.7
Georgia	99.0	81.2	17.8
Maryland	78.4	52.9	25.5
North Carolina	90.0	74.6	15.4
South Carolina	100.0	80.8	19.2
Virginia	56.9	43.8	13.1
West Virginia	91.4	79.4	12.0
East South Central			
Alabama	90.8	71.0	19.8
Kentucky	84.1	68.8	15.3
Mississippi	94.6	73.7	20.9
Tennessee	72.0	57.3	14.7

TABLE 4-7 (continued)

State of Medical School	% Listed as Home State Residents in the Published AMA Data	% of Graduates from Schools in the State Listing the State as Place of Birth	Difference
West South Central			
Arkansas	98.9%	75.3%	23.6%
Louisiana	99.5	77.9	21.6
Oklahoma	96.7	69.6	27.1
Texas	95.6	75.0	20.6
Mountain			
Colorado	69.8	39.1	30.7
Utah	76.[illegible]	50.3	26.6
Pacific			
California	94.0	45.7	48.3
Oregon	73.9	46.0	27.9
Washington	82.4	44.9	37.5

[a]Excludes graduates of the California College of Medicine.

SOURCE: Journal of American Medical Association, Vol. 174, No. 11, November 12, 1960, p. 1449; Vol. 178, No. 6, November 11, 1961, p. 640; Vol. 182, No. 7, November 17, 1962, p. 795.

TABLE 4-8

Percent of Entering Students Listed as State Residents in Published AMA Data versus Percent of Graduates from Medical Schools in the State Listing the State of the Medical School as Place of Birth for the 1963-65 Graduates of Private Medical Schools in Selected States[a]

State of Medical School	% Listed as Home State Residents in the Published AMA Data	% of Graduates from Schools in the State Listing the State as Place of Birth	Difference
Northeast			
Massachusetts	35.7%	30.8%	4.9%
Middle Atlantic			
New York	65.2	57.8	7.4
Pennsylvania	64.8	60.1	4.7
East North Central			
Illinois	39.7	34.8	4.9
West South Central			
Texas	47.0	36.6	10.4
Pacific			
California	55.4	30.5	24.9

[a]Excludes graduates of the California College of Medicine. For source of published AMA data, see footnote at end of Table 4-7.

TABLE 4-9

The Difference in the Percent of Entering Students Listed as State Residents in Published AMA Data and the Percent of Graduates from Medical Schools in the State Listing the State of the Medical School as Place of Birth for the 1963-65 Graduates (Public and Private) for Selected States[a]

State of Medical School	Public	Private
California[b]	48.3%	24.9%
Illinois	4.4	4.9
New York	7.5	7.4
Texas	20.6	10.4

[a]For source of published AMA data, see footnote at end of Table 4-7.

[b]Excludes graduates of the California College of Medicine.

high for graduates from public schools in California, 48.3 percent. This estimate of the error in the birth variable was correlated with the published census figures for percent of native white males, age 15-19 residing in a state in 1960 but were born elsewhere. The correlation coefficient ($r = 0.71$; $r^2 = 0.50$), while statistically significant, still indicates substantial unexplained variance.

Similar calculations for private school graduates in six states are shown in Table 4-8. Table 4-9 has a comparison of the results for the four states included on both the public and private school list. For Illinois and New York, the public and private school graduates have approximately the same percentage differences, 4.6 and 7.5 percent respectively. These percentages can be interpreted as the error resulting from the assumption that state of birth equals state of residence.

In California and Texas, however, the private school graduates have approximately one-half the percentage difference as the public school graduates. This would tend to suggest that the error in the birth variable is not as great as the calculations based on the public school graduates would suggest. One explanation of this possibly inflated estimate of the error for public school graduates is the financial and other incentives to become state residents when applying to public medical schools. This would tend to exaggerate the differences between place of birth and place of residence. But the question is still unanswered when we realize that two of the states (New York and Illinois) had little difference in the two percentage figures.

There is one other argument which would suggest that the

published data on source of medical students cannot provide any information for comparison with the place of birth for medical school graduates. This argument is based primarily on the lack of longitudinal data on the course of medical students and the effects of large numbers of persons.

Consider the situation depicted in Figure 4-1.

FIGURE 4-1

		State of Residence	
		New York	Pennsylvania
State of Birth	New York	a	b
	Pennsylvania	c	d

The number of medical students born and living in New York is a . The number born in New York but living in Pennsylvania is b , etc. Imagine that some portion of b , say b' go to medical school in New York. Therefore in the AMA published data on source of entering students, b' will be recorded as residents of Pennsylvania, but in the biographic history of b' students, their place of birth would be the same as state of medical school, i.e., New York. This would tend to reduce the estimate of the bias in the state of birth variable.

A similar complication, but with opposite bias, would arise for students in c . If students born in Pennsylvania, but residents of New York, go to medical school in New York, the AMA published data would have them as residents of New York. Their biographic history would have state of birth as Pennsylvania, i.e., not equal

to state of medical school. This would tend to increase the estimate of the true error in the state of birth variable.

With the data currently available, there is no method of estimating the magnitude of such bias. However, where states are small, e.g., the Northeast, it is reasonable to suppose that such bias does exist.

CHAPTER 5

MIGRATION RATES OF CATEGORY "6" AND CATEGORY "8" PHYSICIANS

The previous chapters have shown the significance of the type "6" (intern-resident migrant) and the type "8" (cold turkey migrant) physicians to the total physician stock. This chapter will analyze the flows of these physicians. Rates of "out" and "in" migration for states will be quantitatively examined in terms of the economic, demographic and professional medical conditions.

Consider the individual physician as a decision-maker who faces a series of conditions or opportunities. He can decide to stay where he is or migrate to some other location. Presumably such decisions will reflect his preferences and his reactions to the relative opportunities which confront him.

The model presented below is based on the review of the literature in Chapter 2 and contains measures of the economic, professional and non-pecuniary attractions of an area.

Model. The model to be estimated is:

$$\frac{MDIN_i^k}{WMIN_i} = b_0 + b_1 PHY\$_i + b_2 CSTLN_i + b_3 NATRPDT_i + b_4 PHYPOP_i^r + b_5 PUBGRD_i + b_6 PRVGRD_i + b_7 HSESTFF_i + b_8 TCHBEDS_i + \varepsilon$$

where: $MDIN_i^k$ is the number of 1955-1965 medical school graduates in category k practicing in state i in 1971. Category k refers to typology factor "6" or "8" and family or specialist practice, i.e., four categories of physicians.

$WMIN_i$ is the number of white males ($x10^{-5}$) who migrated into state i between 1955 and 1960.

$PHY\$_i$ is the net profit of solo-practice physicians in state i in 1966.

$CSTLN_i$ is the average price of the land for existing FHA housing in 1967 in state i . This is a proxy for non-pecuniary benefits of state i .

$NATRPDT_i$ is the natural rate of population increase between 1960 and 1967 in state i .

$PHYPOP_i^r$ is the ratio of non-federal physicians in category r per 100,000 population in state i in 1963. Category r has two values which correspond to the form of the dependent variable, family practice and specialists.

$PUBGRD_i$ is the number of public medical school graduates graduating from schools in state i in 1966 per 100,000 population.

$PRVGRD_i$ is the number of private medical school graduates graduating from schools in state i in 1966 per 100,000 population.

$HSESTFF_i$ is the number of house staff (interns, residents, fellows) who were graduates of American medical schools and were on duty in state i in 1966.

$TCHBEDS_i$ is the number of hospital beds in institutions used for teaching medical students (including graduate students) in state i in 1966.

The model presented above is for in-migration. The model for out-migration is the same except for the dependent variable which is:

$\frac{MDOUT_i^k}{WMOUT_i}$ where:

$MDOUT_i^k$ is the number of 1955-1965 medical school graduates in category k whose state of residence prior to attending medical school was i , but whose state of practice was not equal to i .[1] Category k refers to typology factor "6" or "8" and family practice or specialist practice, i.e., four categories.

$WMOUT_i$ is the number of white males ($x10^{-5}$) who migrated out of state i between 1955 and 1960.

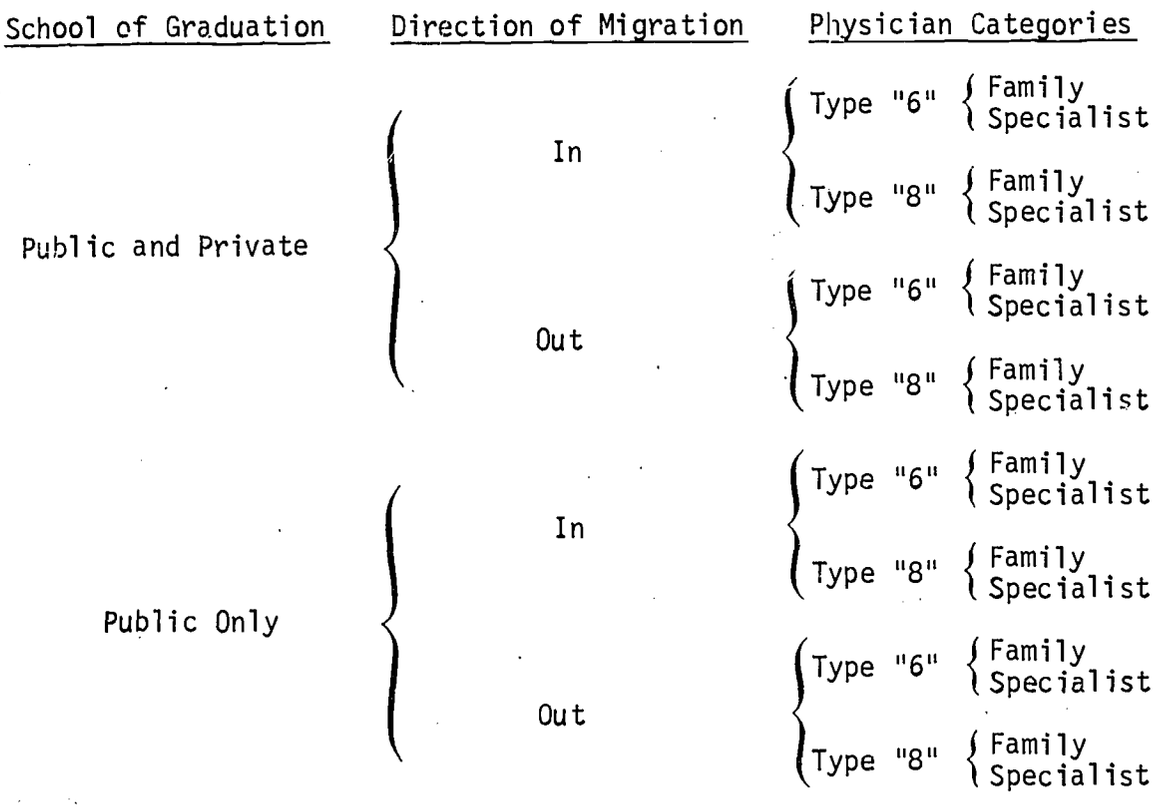
Besides distinguishing between type "6" and type "8" migrants, physicians were further divided into family practice and specialists. Family practice includes General Practitioners, Internists and Pediatricians. Specialist includes the remainder of the medical profession. Consistent with the prior emphasis of this paper, only non-federal, non-academic physicians in direct patient care will be considered. The four separate equations in each direction of movement (eight equations) represent four categories of physicians: type "6" family and type "6" specialist; type "8" family and type "8" specialist.

Because of the uncertainty of the place of birth variable, a separate but parallel set of equations for "public graduates only" was estimated. This set of equations used the state of the medical school as the state of residence prior to attending medical school. The results of the "public graduates only" equations will provide some indication of the reliability of the model of both public and private graduates which used the state of birth as the place of residence prior to attending medical school. Figure 5-1 provides

[1] For the model of both public and private graduates, state of birth was used as state of residence prior to attending medical school. For the model of public graduates only, the state of the medical school attended was used as the state of prior residence.

FIGURE 5-1

The Separate Equations Estimated



a summary of the equations estimated, and the data sources of the independent variables can be found in Appendix 3.

Dependent Variable. The dependent variable shown above is the rate of physician migration relative to the white male migration. This form of the dependent variable was chosen for two reasons. First, since this is a cross sectional model of states, it can be anticipated from previous studies that heteroscedasticity is likely to result when the dependent variable is gross flows. The second reason for the choice of the dependent variable is that the white male migration reflects the many extensive social, economic and demographic forces within the U.S. Chapter 3 showed the parallels of physician and white male migration and discussed the reasons for analyzing physician migration in the context of white male migration.

A partial list of the forces and effects reflected in white male migration would include the following:

1. Migration from rural to urban areas.
2. Migration from areas of declining economic opportunities to growing economic opportunities.
3. Movement from urban centers to suburban areas.
4. Migration to the three coasts of the U.S.

The origins of these forces are complex and extensive, and to incorporate all of them into a model would be practically impossible. But whatever these forces are, they have effects on physician movement, and white male migration is a subtle method of incorporating these external forces into the model.

Since the object is to measure the effect of independent variables on physician migration, the ratio form of the dependent

variable can lead to complications in interpretation of coefficients under certain conditions. These conditions would occur whenever a right-hand variable would have an equal relationship (after a scale adjustment) to both the quantities in the numerator and the denominator of the dependent variable. The result would be an estimated coefficient indicating little or no relationship to the dependent variable, which would be true. But it would not be true to state that such a variable had no relationship to the migration of physicians.

With the exception of the cost of land index ($CSTLN_i$), all of the right-hand variables are not likely to have any significant relationship to the migration of white males. For example, the net profit of solo-practice physicians is not likely to have an effect on either the out- or in-migration of white males.

However, to the extent that both white male migrants and physician migrants are equally affected by non-pecuniary benefits of a state, then the coefficient on $CSTLN_i$ will not accurately indicate the true relationship to physician migration. Fortunately for this analysis, the non-pecuniary benefit variable is not directly amendable to policy changes.

Independent Variables. With the exception of the natural increase in the population, all of the independent variables represent an intersection of a demand and supply schedule (not necessarily in long-run equilibrium), which would be altered in some manner by the addition (in-migration) or reduction (out-migration) of a physician. This does not mean, however, that an individual's decision on a practice location is likely to take account of his affect on the supply schedule of health services. With the exception of very small

TABLE 5-1

Correlation Coefficients for the Independent Variables[a]

	Physician Income	Land Index	Natural Increase in the Pop.	Family Physicians Per Pop.	Specialist Per Pop.	Public Medical School Grads. Per Pop.	Private Medical School Grads. Per Pop.	Non-Foreign House Staff Per Pop.	Teaching Beds Per Pop.
Physician Income	1.00								
Cost of Land Index	-.13	1.00							
Natural Increase in the Population	.07	-.02	1.00						
Family Physicians Per Population	-.22	.35	-.55	1.00					
Specialist Per Population	-.25	.57	-.46	.82	1.00				
Public Medical School Graduates Per Population	.33	-.13	.20	-.27	-.27	1.00			
Private Medical School Graduates Per Population	-.23	.18	-.24	.18	.29	-.25	1.00		
Non-Foreign House Staff Per Population	-.21	.40	-.05	.36	.30	.09	.44	1.00	
Teaching Beds Per Population	-.12	.43	-.25	.51	.49	-.21	.42	.49	1.00

[a]Unit of observation is the fifty states of the U.S. minus the following: Washington D.C., Alaska, Hawaii, Idaho, Maine, Montana, Nevada, New Mexico, North and South Dakota, Utah, Vermont, Wyoming (thirty-eight states remaining).

states and a few limited specialities, one would not expect the addition of one physician to significantly alter the supply schedule. As a consequence, one should interpret the independent variables as the opportunities or conditions faced by the individual physician in his choice of a practice location.[2]

Physician Income. There is a shortage of good data on physicians' income. This is most unfortunate considering the expected role of wages in a market economy. The income used for this research was the 1966 net profit of solo practitioners. One would expect that physicians would be moving into states of high income and out of states of low physician income.

Cost of Land Index. The estimated price of land for existing FHA housing in 1967 was used as a proxy variable for non-pecuniary benefits of an area. In his excellent article on human migration,[3] Larry Sjaastad argues that if a place is preferred over others as a place to work or live, this preference will be reflected in the return on the factor in limited supply (land). This is a reasonable argument on sound theoretical basis.

Such a proxy variable for non-pecuniary benefits certainly has more elegance and appeal to it than that suggested by other authors such as parks, recreation areas, and degree days of cold weather. Other things equal, one would expect physicians to be moving to

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[2] A likely criticism of this analysis is the long time periods involved. There are eleven years of medical school graduates aggregated into one time period. One can presume that the demand and supply schedules did change over time, so that all the physicians did not face the same set of conditions. In general the value of the independent variables in 1965-66 were used. This is the approximate mid-point of the period of location for 1955-1965 graduates.

[3] Larry A. Sjaastad, "The Costs and Returns of Human Migration," Journal of Political Economy, Supplement, October 1962, pp. 80-93.

areas of high cost land and away from areas of low cost land.

Natural Increase in the Population. The estimated rate of natural increase (as distinct from migration) of the population between 1960 and 1967 should provide a measure of expected d l for physician services. Furthermore, physicians are likely to find it easier to establish a practice in a growing community than in one that is not expanding.

Physician Per Population Ratio. The physician per population ratio is a measure of the stock of physicians in a state. Even if demand for physician services is growing, the existence of a large physician stock would have a dampening effect on the in-migration of new professionals.

Contrary to this argument is the recognition of the general "concentrating" forces prevailing in our society. The population is becoming more and more densely settled. Economists, engineers and other professionals are a few examples of persons who want to be near their own kind. Physicians, like much of our society, are becoming more and more professionally oriented, which means that association with other professionals is preferred. Furthermore, physicians are concentrated in the urban-metropolitan areas, where not only social amenities are available, but also where the better hospitals are located. Therefore, the sign of the coefficient on this variable will be an empirical matter.

The equations for specialist migration include the specialist per population ratio and exclude the family physician per population ratio. The same situation applies to the family physician migration, except that the stock of Doctors of Osteopathic medicine are included

in with the Doctors of Medicine stock. It is felt that D.O.'s are competitors with family physicians and in some states are a substantial portion of the physician population. For example, in Missouri and Michigan, D.O.'s were 17 to 20 percent of the physician stock in 1963.[4]

Medical School Graduates Per Population. The local production (per population) of medical schools measured in both public and private school graduates in 1966 is a measure of local competition. Local graduates are the most likely additions to the state's stock of physicians. Physicians who migrate into the state are at a disadvantage in choosing a place to practice when compared to local graduates. Therefore one would expect that in-migration should be negatively correlated with local production.[5] Similar reasoning would suggest that states with high numbers of local graduates would also be the source of out-migrant physicians.

Non-Foreign House Staff Per Population. The number of U.S. graduate house staff on duty in the state was deflated by the population. This variable is a measure of the professional opportunities for graduate training and also provides one measure of the medical professionalism of the state. The migration into states is expected to be positively correlated with this variable.

Teaching Beds Per Population. The Sloan and Yett paper, cited in Chapter 2, strongly suggests that teaching hospitals are competitors

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[4] U.S. Bureau of the Census, Statistical Abstract of the United States: 1965, (86th edition), Washington, D.C., 1965, p. 69.

[5] The R^2 for a simple regression of the number of type "1" physicians in a state and the number of local graduates is 0.88. The results were similar when the number of type "1" and "2" physicians were regressed on the number of local graduates.

with local physicians. This is reasonable when consideration is given to the substantial volume of medical services produced by such institutions.

One would expect that there would be collinearity between this and the above variables. However, surprisingly, the highest simple correlation between teaching beds per population and the other variables is only 0.5 (physician per population ratios). In fact, Table 5-1 shows that the correlations of all the variables are relatively low.

Since the flows in the equations estimated are for non-academic, private practice[6] physicians only, this model will provide a test of the hypothesis of competition between teaching hospitals and local physicians.

Empirical Results. The regression results for "in" migration are presented in Tables 5-2 and 5-3, and "out" migration in Tables 5-4 and 5-5. The dependent variables are across the top of the page and the independent variables are down the left side. Each column of the tables represents a different migrant flow (and therefore a different equation). There are three numeric values given; the first is the coefficient of the independent variable, followed by the corresponding t statistic and elasticity.[7] The residual degrees of freedom is shown at the bottom of the table and is either twenty-nine or twenty-two. The number of observation points (states) used for all equations except the out-migration of "public graduates only" was

[6] Includes hospital based non-academic physicians.

[7] Elasticity is measured at the mean value of the dependent and independent variables.

TABLE 5-2

Regression Results for the In-Migration Rate
of Public and Private Medical School Graduates

Independent Variables	In-Migration Rate (Dependent Variable)			
	Type "6" Migrants[a]		Type "8" Migrants[b]	
	Family Practice	Specialists	Family Practice	Specialists
Physician Income	1.58×10^{-3} (2.05) 0.943	2.75×10^{-3} (1.81) 0.878	2.92×10^{-4} (0.22) 0.124	2.00×10^{-4} (0.11) 0.044
Cost of Land Index	6.82×10^{-3} (1.76) 0.500	8.67×10^{-3} (1.00) 0.340	1.39×10^{-2} (2.04) 0.723	8.93×10^{-3} (0.10) 0.239
Rate of Natural Increase in the Population	1.89 (1.20) 0.550	1.87×10^{-1} (0.06) 0.029	1.46 (0.53) 0.303	4.38 (1.19) 0.466
Family/Specialist Physicians Per Population	1.27 (3.18) 1.721	1.91 (1.91) 1.221	3.94×10^{-1} (0 56) 0.376	2.04 (1.60) 0.888
Public Medical School Graduates Per Population	-6.38 (3.24) -0.391	-1.07×10 (2.84) -0.351	-4.10 (1.19) -0.178	-1.37×10 (2.87) -0.308
Private Medical School Graduates Per Population	-4.80 (2.50) -0.152	-2.45 (0.68) - .041	-2.25 (0.67) -0.051	-6.68 (1.46) -0.077
Non-Foreign House Staff Per Population	2.61 (4.81) 0.828	5.86 (5.68) 0.994	3.32×10^{-1} (0.35) 0.075	-1.41×10^{-1} (0.11) -0.016
Teaching Beds Per Population	-2.32×10^{-2} (0.58) -0.133	1.05×10^{-2} (0.14) 0.032	-8.84×10^{-2} (1.25) -0.360	-7.50×10^{-2} (0.77) -0.157
Constant	-117.40	-161.05	- 0.77	- 8.90
Residual Degrees of Freedom	29	29	29	29
R^2	0.77	0.78	0.24	0.44

NOTE: 1st number is the coefficient; 2nd number in ( ) is the t statistic; 3rd number is the elasticity at the mean.

[a]State of practice equals state of graduate training but not state of medical school or birth.

[b]State of practice does not equal state of medical school, graduate training or birth.

TABLE 5-3

Regression Results for the In-Migration Rate
of Public Medical School Graduates

Independent Variables	In-Migration Rate (Dependent Variable)			
	Type "6" Migrants[a]		Type "8" Migrants[b]	
	Family Practice	Specialists	Family Practice	Specialists
Physician Income	9.67×10^{-4} (2.32) 1.447	1.47×10^{-3} (1.91) 1.124	4.51×10^{-4} (0.66) 0.430	4.37×10^{-4} (0.44) 0.228
Cost of Land Index	3.37×10^{-3} (1.59) 0.613	4.50×10^{-3} (1.02) 0.422	4.02×10^{-3} (1.17) 0.470	4.20×10^{-3} (0.74) 0.269
Rate of Natural Increase in the Population	2.16 (2.52) 1.561	4.22×10^{-1} (0.29) 0.457	1.85 (1.33) 0.861	2.60 (1.38) 0.662
Family/Specialist Physicians Per Population	7.74×10^{-1} (3.53) 2.594	4.71×10^{-1} (0.92) 0.720	5.00×10^{-1} (1.40) 1.076	5.75×10^{-1} (0.88) 0.600
Public Medical School Graduates Per Population	-1.38 (1.29) -0.211	- 3.37 (1.76) -0.260	7.44×10^{-1} (0.43) 0.073	-7.75×10^{-1} (0.32) -0.013
Private Medical School Graduates Per Population	-1.32 (1.26) -0.104	-5.74×10^{-1} (0.31) -0.023	-2.70×10^{-1} (0.16) -0.014	-4.71×10^{-1} (0.20) -0.013
Non-Foreign House Staff Per Population	1.08 (3.63) 0.847	2.48 (4.73) 1.004	-1.54×10^{-1} (0.32) 0.078	1.01×10^{-2} (0.01) 0.003
Teaching Beds Per Population	-5.64×10^{-2} (2.56) - .801	-7.20×10^{-2} (1.84) -0.528	-8.36×10^{-2} (2.33) -0.764	-1.22×10^{-1} (2.42) -0.610
Constant	-81.73	-51.64	-31.13	- 4.51
Residual Degrees of Freedom	29	29	29	29
R^2	0.67	0.60	0.27	0.29

For Notes and Footnotes, see Table 5-2.

TABLE 5-4

Regression Results for the Out-Migration Rate of Public and Private Medical School Graduates

Independent Variables	Out-Migration Rate (Dependent Variable)			
	Type "6" Migrants[a]		Type "8" Migrants[b]	
	Family Practice	Specialists	Family Practice	Specialists
Physician Income	-3.56×10^{-4} (0.44) -0.198	2.09×10^{-4} (0.13) 0.064	-1.74×10^{-3} (1.36) -0.774	-2.13×10^{-3} (0.91) -0.524
Cost of Land Index	-6.40×10^{-4} (0.16) - .004	-4.13×10^{-3} (0.44) -0.155	-8.51×10^{-4} (0.16) -0.047	-2.87×10^{-3} (0.21) -0.087
Rate of Natural Increase in the Population	-2.60x10 (1.56) -0.706	-2.06 (0.67) -0.307	-2.50 (1.19) -0.543	-1.60 (0.36) -0.192
Family/Specialist Physicians Per Population	1.72×10^{-1} (0.41) 0.216	1.19 (1.11) 0.725	-1.76×10^{-1} (0.33) -0.177	7.78 (0.50) 0.432
Public Medical School Graduates Per Population	5.22 (2.50) 0.298	7.02 (1.74) 0.220	9.14 (3.47) 0.418	1.36x10 (2.34) 0.343
Private Medical School Graduates Per Population	4.60 (1.60) 0.365	8.25 (2.15) 0.134	8.02 (3.12) 0.189	1.51x10 (2.72) 0.196
Non-Foreign House Staff Per Population	-1.30 (2.26) -0.383	-1.41 (1.28) -0.228	-1.06 (1.47) -0.251	-1.89 (1.19) -0.246
Teaching Beds Per Population	6.83×10^{-2} (1.60) 0.365	8.77×10^{-2} (1.06) 0.256	6.75×10^{-2} (1.25) 0.289	1.60×10^{-1} (1.35) 0.378
Constant	57.97	23.31	104.27	74.67
Residual Degrees of Freedom	29	29	29	29
R^2	0.45	0.33	0.51	0.38

For Notes and Footnotes, see Table 5-2.

TABLE 5-5

Regression Results for the Out-Migration Rate of Public Medical School Graduates

Independent Variables	Out-Migration Rate (Dependent Variable)			
	Type "6" Migrants[a]		Type "8" Migrants[b]	
	Family Practice	Specialists	Family Practice	Specialists
Physician Income	4.40×10^{-4} (0.61) 0.383	2.65×10^{-4} (0.22) 0.121	-4.02×10^{-4} (0.46) -0.271	-9.87×10^{-4} (0.63) -0.382
Cost of Land Index	-3.80×10^{-3} (0.91) -0.396	-1.01×10^{-2} (1.12) -0.550	-7.15×10^{-3} (1.42) -0.578	-5.33×10^{-3} (0.46) -0.247
Rate of Natural Increase in the Population	-4.36×10^{-1} (0.28) -0.189	8.19×10^{-1} (0.32) 0.185	1.16 (0.62) 0.388	1.60 (0.49) 0.307
Family/Specialist Physicians Per Population	2.87×10^{-1} (0.78) 0.545	4.31×10^{-1} (0.49) 0.379	9.48×10^{-2} (0.21) 0.140	-6.66×10^{-1} (0.59) -0.498
Public Medical School Graduates Per Population	9.87 (4.89) 1.020	1.61×10 (4.87) 0.872	1.47×10 (6.03) 1.180	2.10×10^{1} (4.93) 0.964
Private Medical School Graduates Per Population	2.45 (1.16) 0.096	2.42 (0.71) 0.050	6.44 (2.53) 0.196	6.86 (1.58) 0.120
Non-Foreign House Staff Per Population	2.16×10^{-1} (0.36) 0.102	1.14 (1.11) 0.282	1.26×10 (1.71) 0.462	2.64 (2.00) 0.556
Teaching Beds Per Population	-1.35×10^{-2} (0.25) -0.102	-4.52×10^{-2} (0.52) -0.178	-9.46×10^{-2} (1.46) -0.553	-1.14×10^{-1} (1.01) -0.382
Constant	-13.08	- 8.75	1.34	36.00
Residual Degrees of Freedom	22	22	22	22
R^2	0.64	0.62	0.71	0.63

For Notes and Footnotes, see Table 5-2.

thirty-eight. Twelve states which were either small, or very rural, were excluded.[8] The equations of the out-migration of graduates from public medical schools were based on only the thirty-one states with public medical schools.

In general, the equations for type "6" physicians are better behaved than the equations for the type "8" physicians, although there are some exceptions. Since the type "8" physician is in basically a residual class, this is not too surprising, especially when the error in the birth variable is considered. The "public graduate only" equations are consistent with and support the results for the "both graduates" equations.[9]

Physician Income. The results for physician income are mixed. Generally the coefficient has the expected sign, i.e., positive for in-migration and negative for out-migration. There are three instances when the coefficient enters with the wrong sign, but these occurred when there were large standard errors.

For all the in-migration equations, the intern-resident migrants have a higher income elasticity of migration than do the "cold turkey migrants." However, the case of out-migration is not so clear. This is probably a reflection of the fact that in leaving a state, the difference between type "6" and type "8" physicians is not as distinct.

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[8] Following states were excluded: Alaska, Hawaii, Idaho, Maine, Montana, Nevada, New Mexico, North and South Dakota, Utah, Vermont, Wyoming, and Washington, D.C.

[9] The differences between type "6" and type "8" out-migrants is not as distinct as for the case of in-migrants. But it is known that type "6" migrants did leave the state of their medical school for graduate training, while it is only possible that type "8" migrants left. Therefore, the effects of better house staff programs on reducing the flow of physicians out of a state should be more pronounced for type "8's."

In all cases but one, the family physicians have a higher income elasticity than the specialists. This behavior would generally be consistent with a model of the specialist having more professional goals and being subsequently less induced by pecuniary rewards. The lower income elasticity of the specialists is also consistent with a hypothesis of the expected income levels of the two groups and diminishing marginal utility, i.e., specialists have or can expect to have higher incomes than family practice physicians with a subsequent lower income elasticity.

The higher income elasticity of family practice physicians is also encouraging from the policy viewpoint. The concern of public officials over primary care physicians (family practice) can take some respite in the knowledge that there is something of a lever available to them in their ability to affect physicians' income.

Non-Pecuniary Benefits. The FHA land price index also enters with the expected sign. Physicians are moving to states with high land prices at a greater rate than are white males. This will not come as a surprise to most observers, but is reassuring to be able to measure it empirically. Although non-pecuniary benefits do not represent much of a policy variable, it is interesting to note the elasticity. Whenever the t statistic is reasonably high (and therefore the estimate is more certain), the elasticity of migration with respect to the non-pecuniary benefits is also relatively high compared to the other variables.

Natural Rate of Population Increase. The coefficients on natural population increase also enters with the expected signs (positive with respect to in-migration and negative with respect to out-migration)

in all cases but one. This is encouraging when the low variance of this variable is considered. There is further reassurance from this variable when the correlation coefficients in Table 5-1 are considered. The places with high natural population growth are generally those areas with low physician population ratios (e.g., the south and the Mountain states). The movement of physicians to these areas when "all else is constant" (or nearly so), should be consoling to policy-makers. Furthermore, the family physicians generally have a higher elasticity of movement with this variable.

Physician Population Ratios. In general, physicians are going to states where there are other physicians. However, physicians are not necessarily deterred from leaving places of high physician population ratios. The standard errors are, however, generally large in the latter case.

The high elasticities (both absolutely and relative to the other variables) of "in-migration" with respect to the physician stock is significant. This strongly implies that there is a concentrating effect in physician behavior similar to the rest of the population. It should be recalled at this time that the independent variable used here excludes academic physicians so the movement to the "centers of excellence" are not necessarily observed, although it cannot be ruled out.

Medical School Graduates Per Population. The production of local graduates leads to higher exports and lower imports. This is true for both public and private school graduates, although less so for the private schools. The slight difference between public and private graduates is, of course, consistent with the more national market of private schools. This behavior was previously cited

several times in earlier chapters.

Compared with the overall results, the robustness of the public medical school variable is impressive. The standard errors were always small, and the sign of the coefficient was always as expected. In addition, the elasticity is generally well behaved without any extraordinary variations. Only the elasticity of out-migration in the "public graduate only" equations provides surprising results. In these equations, the elasticity of out-migration is uniformly close to one, implying a one-to-one export of newly produced physicians. Fortunately the rate of in-migration is relatively inelastic with respect to the public graduate variable. As will be shown in Chapter 7, the overall aggregate results suggest that the state is still better off in producing more graduates.

Non-Foreign House Staff Per Population. The results for the non-foreign house staff variable are not as robust as for the medical school graduate variable. The signs of the coefficients do not present a uniform pattern, with in-migration being positive and out-migration being mixed. The out-migration of the "public graduate only" equations is especially unusual, indicating that the presence of house staff implies that states will have a higher export rate of physicians.

The distinction between the type "6" and the type "8" physicians in the in-migration equations is notable. In fact, the results are so uniform there may be cause for some skepticism. In all cases of in-migration for type "6" physicians, the t statistics are very large and even more surprising is the almost uniform unitary elasticity. It seems possible that there is a strong statistical relationship

of the following form:

$$\text{No. of House Staff} = f(\text{No. of type "1" and "2" physicians, No. of type "6" physicians})$$

As was pointed out in footnote 5, there is a high correlation between the number of type "1" and "2" physicians and the number of public and private graduates (which is included in the equations estimated). Rearranging the above expression presents a model somewhat similar to the in-migration of type "6" physicians. What is missing in the above expression is the number of house staff who left the state to practice elsewhere after having completed their training. There is no reason to suppose that the above expression is an identity, but the results are still of a form as to cause some skepticism. If the skepticism on these four equations is dropped, the interpretation of the results is that house staff programs do cause an increase in the number of in-migrant physicians.

This statistical relationship of concern above does not apply to the type "8" migrants in any equation nor to the type "6" out-migrants. The results for these twelve equations do provide some surprises. In general, there is little evidence to suggest that house staff positions cause an "atmosphere of professionalism" that induces physicians to migrate to the state. The coefficients on the in-migration of type "8" physicians are never statistically significant. Furthermore, the evidence that house staff positions reduces the flow out of physicians is mixed at best. Although the "public and private" equations have a negative sign on the out-migration equations, they are consistently inelastic (approximately -0.2). For the "public graduate only" equations, the coefficients have the opposite sign,

being statistically significant at the .01 level for the type "8" physicians.

Teaching Beds Per Population. The sign of the coefficient on the teaching bed variable generally supports the hypothesis raised by Sloan and Yett of competition between teaching institutions and local physicians. The equations for the out-migration of "public graduates only" contradict this conclusion, but the standard errors are very large. Whenever the standard errors are small, the hypothesis is supported.

If teaching institutions did compete with local physicians, one would expect that specialists would especially feel the competition. However, the elasticity of migration for specialists is generally lower than the elasticity for family practice. This is a counter-intuitive result. Possibly, the results are consistent with a notion of quality discrimination that family practice physicians encounter near large teaching institutions. Finally, one should note that if there is a competitive effect, the elasticity is generally very low.

In conclusion, one should observe that the migration patterns of physicians are consistent with reasonable hypothesis of economic and professional behavior. The results indicate that there is a market operating to allocate physicians and that there are instruments amenable to public policy.

The type "6" and type "8" physicians do have definite differences in their migration behavior as do the family practice and specialist physicians. Physicians are professionals desiring to practice where they have colleagues and non-pecuniary benefits and yet demonstrate consistent rational economic behavior as to income and competition.

CHAPTER 6

SELECTIVITY OF THE MEDICAL SCHOOL OF GRADUATION AND MIGRATION

Except for the case of foreign medical school graduates, there is a paucity of research regarding the "quality" of physicians.[1] This is probably a general reflection of the attitude that the licensure requirements are such as to provide only "Cadillac doctors" or at least only "professionally competent" physicians.

The principle criteria by which the medical license is granted to persons attending a medical school in the U.S. is graduation from an approved medical school. Although there has been little or no study of the relationship between quality of the school, performance in school, and performance healing the ill, one must guess that there is some relationship.[2] There are, of course, many practical problems to testing the competence of most professionals, including physicians, but as economists are seldom reticent to point out, medicine (and law) are generally unique in the extent of restraint of entry into the profession.[3]

This research will not wrestle with these difficult questions.

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[1] See H. Margulies, L. S. Block, Foreign Medical Graduates in the U.S., (Cambridge, Massachusetts, Harvard Press, 1969) Chapter 3, "The Professional Qualities of Foreign Medical Graduates."

[2] For one attempt at testing some of these relationships, see O. L. Peterson, L. P. Andrews, Robert S. Spain, and B. G. Greenberg, "An Analytical Study of North Carolina General Practice, 1953-54," Journal of Medical Education, 31 (1956).

[3] See M. F. Friedman, Capitalism and Freedom, (Chicago, Illinois: University of Chicago Press, 1962) Chapter 9; and E. Rayack, Professional Power and Medicine: The Economics of the American Medical Asscciation (Cleveland: World Publishing Company, 1967).

However, unpublished data regarding the average scores by medical school on the science section of the Medical College Admission Tests (MCATS) for the entering class of 1966[4] were fortunately obtained. It is intended to use this data as a proxy for the "selectivity" of the medical schools regarding admissions. Although there is a heuristic reaction to equate this measure of "selectivity" with "quality" of the medical school (and subsequently the graduates), no such equation is intended. The relationship of quality of the school, quality of the graduate, and quality of the medical care provided (over time) are more complex questions.

Shown in Table 6-1 is the distribution of recent graduates grouped by selectivity of medical school. The first quartile has a preponderance of private school graduates (78.4 percent), while the fourth quartile has significantly more public graduates than private graduates. The high number of private graduates in the upper quartiles remains even when the grouping is enlarged to the first two quartiles. Approximately seventy-five percent of the graduates in the first two quartiles are graduates of private schools.

Although Margulies, et.al., observe that American Board certification "is obtained only after the candidate passes very demanding examinations," the authors stop short of proclaiming board certification a "quality" index.[5] Again the author of this thesis does not intend to link "quality" with board certification. However, it is probably fair to state that board certification is another form of

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[4]Unpublished data from the Association of American Medical Colleges.

[5]H. Margulies, et.al., op.cit., p. 45.

TABLE 6-1

Distribution of the 1955-1965 Graduates of American Medical Schools Grouped by Medical School Selectivity Ratings[a]

Selectivity Quartile		Public School Graduates	Private School Graduates	Total
1	N	4,084	14,845	18,929
	%	21.6	78.4	100.0
2	N	7,207	11,060	18,267
	%	39.5	60.5	100.0
3	N	9,935	4,742	14,677
	%	67.7	32.3	100.0
4	N	10,607	5,967	16,574
	%	64.0	36.0	100.0
Total	N	31,833	36,614	68,447
	%	46.5	53.5	100.0

[a]Based on the population of 78,424 physicians. Physicians in training are excluded as well as the graduates of the California College of Medicine. Selectivity ratings based on the average science Medical College Admission Test scores of the entering class of 1966. (Unpublished data).

selectivity in the profession. Is there any correspondance between board certification and selectivity of medical school attended?

Shown in Table 6-2 is the distribution of board and non-board certified physicians by the selectivity of school of graduation. Although there is currently a speciality board for Family Practice (GP), for the physicians of the data sample there were no physicians listed as members. This is probably a reflection of the recent formation of this board (1970).

For both public and private school graduates, there is a positive monotonic relationship between the selectivity index and the percent of the physicians in General Practice. While 6.9 percent of the first quartile physicians are in General Practice, 23.4 percent of the fourth quartile physicians are in General Practice.

Aside from observing that a higher percentage of physicians in the upper quartiles specialize, of those who do so, a higher percentage are board-certified than for physicians from the less selective medical schools. While 56.3 percent of the first quartile graduates are board-certified, only 39.4 percent of the fourth quartile graduates are board-certified.[6] Considering only physicians who specialize (i.e., excluding GP's), the percentage difference, while statistically significant, is not as great as when GP's are included. Approximately sixty percent of the first quartile specialists are board-certified, while the corresponding figure for fourth quartile physicians is fifty-two percent.

Generally within a given quartile, there are no significant

[6]Because of the large sample size, there is little question that the differences are statistically significant.

TABLE 6-2

Board Certification of 1955-1965 Graduates of American Medical Schools
Grouped by Medical School Selectivity Quartile Ratings

Selectivity Quartile		Public School Graduates				Private School Graduates				Public & Private School Graduates			
		Board Certified	Not Board Certified		Total	Board Certified	Not Board Certified		Total	Board Certified	Not Board Certified		Total
			Non-GP	GP			Non-GP	GP			Non-GP	GP	
1	N	2,274	1,492	318	4,084	8,392	5,472	981	14,845	10,666	6,964	1,299	18,929
	%	55.7	36.5	7.8	100.0	56.5	36.9	6.6	100.0	56.3	36.8	6.9	100.0
2	N	3,504	2,472	1,231	7,207	5,812	3,940	1,308	11,060	9,316	6,412	2,539	18,267
	%	48.6	34.3	17.1	100.0	52.5	35.6	11.8	100.0	51.0	35.1	13.9	100.0
3	N	4,272	3,421	2,242	9,935	2,081	1,840	821	4,742	6,353	5,261	3,063	14,677
	%	43.0	34.4	22.6	100.0	43.9	38.9	17.3	100.0	43.3	35.8	20.9	100.0
4	N	4,116	3,710	2,781	10,607	2,422	2.446	1,099	5,967	6,538	6,156	3,800	16,574
	%	38.8	34.2	26.2	100.0	40.6	41.0	18.4	100.0	39.4	37.1	23.4	100.0
Total	N	14,166	11,095	6,572	31,833	18,707	13,698	4,209	36,614	32,873	24,793	10,781	68,447
	%	44.5	34.9	20.6	100.0	51.1	37.4	11.5	100.0	48.0	36.2	15.8	100.0

[a]Excludes all physicians still in training and all graduates of California College of Medicine. Based on the 1955-65 graduates of American medical schools. Selectivity ratings based on the average science Medical College Admission Test scores for the entering class of 1966. (Unpublished data).

differences between the public and private school graduates. However, for the second quartile graduates, there is a greater tendency for public graduates to enter General Practice than for private graduates. As a result a higher percentage of private than public graduates from second quartile schools are board-certified; but for those who specialize, there is little difference in the percentage of private and public graduates who are board-certified (59.6 vs. 58.6 percent).

Selectivity of the Medical School of Graduation and the Probability of Migrating from the State of Graduation

The question might be asked, "Does the selectivity of the school of graduation affect the probability that physicians will leave the place of graduation?" In other words, do more selective schools either attract students or create such changes in students who are more likely to enter a national as opposed to a local market in the selection of a place to practice?

Ideally, the selectivity data should be for individuals, since it is individuals who decide to stay or to migrate. The data used, however, are medical school averages. Therefore the probability to migrate or stay will be based on the proportion of individuals from certain selective schools who migrate or stay.

Since there is a general tendency to return home after medical school, we need to exclude individuals whose place of prior residence is uncertain or unknown. The individuals selected in this study were individuals who were born in a certain state and went to medical school in that same state. Although this does not completely eliminate the "place of birth" versus "place of prior residence" problem, it is

felt that the errors would be minimal. One of the costs of this approach is that the subset selected is smaller than the entire eligible population. Sample size is not a serious problem in this case, and if the assumption is made that the probability to migrate is independent of the "place of birth" versus "place of prior residence" problem, then this procedure should be suitable.

The final procedural question was choosing states which had medical schools of differing selectivity as regards admissions, and whose medical schools admitted reasonable numbers of state residents. The seven states selected, along with the number of medical schools and the number of different selectivity quartiles represented are shown in Table 6-3.

Included in the physicians' biographical record is a history of government service. This history includes which branch of government service and dates served, but does not include geographically where the physician served. It was felt that having had government service with the subsequent travel and new contacts, at a decision-prone time of life, would likely have an effect on the decision to migrate. Therefore, all females were excluded and the sample was divided into those physicians with and without a history of government service. Finally, all physicians currently employed by the federal government and all physicians still in training were excluded.

In order to keep the data on selectivity of the medical school confidential, all the tables relevant to this discussion will be in Tables A-6-1 - A-6-7 (which can be removed for later dissemination). In several cases, the absolute numbers in the various cells would be specific indicators of what medical school was in what selectivity quartile.

TABLE 6-3

Numbers of Medical Schools and the Numbers of Selectivity Quartiles Represented for a Sample of States

State	Number of Medical Schools[a]	Number of Selectivity Quartiles Represented[c]
New York	10	3
Pennsylvania	5[b]	2
Illinois	5	4
Ohio	3	3
Georgia	2	2
North Carolina	3	3
Louisiana	2	2

[a]With graduating classes between 1955-1965.

[b]Excludes Women's Medical College.

[c]Selectivity ratings based on the average science Medical College Admission Test scores for the entering class of 1966.

New York. The statistics for male physicians who were born and went to medical school in New York are shown in Table A-6-1. Overall 47.9 percent of such physicians were not practicing in New York in 1971. This figure is composed of fifty-three percent of those with government service and forty percent of those without government service practicing somewhere other than New York. This implies that 12.6 percent more of the male physicians who had a history of government service had left New York to practice than had the male physicians without a history of government service (percentage difference statistically significant at $\alpha<.001$).[7] The percentage difference for physicians with and without government service is about the same for all selectivity quartiles.

Such a substantial difference in the percent of physicians leaving New York is a surprise. This strongly suggests that the decision to separate the physicians into those with and without government service was correct, but more fundamentally suggests that government service is a significant factor in the mobility of the physician population.

Table A-6-1 also contains the information for a contingency test of the null hypothesis of no relationship between government service and the probability of leaving New York to practice. The χ^2 statistic between these two variables is 69.6 which leads to rejection of the null hypothesis at an α level of less than .001. Although there is some difference by selectivity of the school of graduation, the null hypothesis of no relationship is rejected in all cases at an α level of $<.05$.

[7] α is probability of type 1 error.

The differences in the percentages leaving New York by selectivity of the school of graduation are shown in Table A-6-1. For physicians with a history of government service, 52.4 percent in the first quartile left while 56.1 percent of the fourth quartile left (percentage difference significant at the $\alpha<.30$). For physicians without a history of government service, 39.2 percent of the first quartile left New York, while 44.1 percent of the fourth quartile also left New York (percentage difference significant at the α level of <0.30).

Therefore, as far as selectivity of the medical school is concerned, for New York there is a slightly higher percentage from the more selective schools who stayed than for the less selective schools. There are similar results for the physicians without a history of government service.

As can also be seen in Table A-6-1, the χ^2 statistic indicates rejection of the null hypothesis (no relationship between selectivity of the medical school and the probability of leaving) only with a fairly high probability of a type 1 error (i.e., 0.5 and 0.3) which generally implies that the null hypothesis should not be rejected.

In summary then, the case of New York strongly supports the hypothesis that physicians with a history of government service are much more likely to migrate from their state of birth and place of medical school. However, the hypothesis that graduates of more selective schools are more likely to migrate does not receive much support and in fact there is weak evidence to support the opposite, i.e., graduates of more selective schools are more likely to stay than are graduates of less selective schools.

Pennsylvania. Similar statistics, as presented above, are shown for Pennsylvania in Table A-6-2. The strong relationship between a history of government service and the probability of migrating out is evident. While forty-nine percent of the physicians with government service left Pennsylvania, only thirty-eight percent of the physicians without a history of government service left (a difference of 10.8 percent, statistically significant at an $\alpha<.001$). This pattern of behavior does not vary by the selectivity quartile of the school of graduation. Finally, the null hypothesis of no relationship between government service and the probability of leaving is rejected with a probability of a type 1 error of less than .001.

Overall 44.2 percent of the physicians who went to medical school and were born in Pennsylvania are practicing elsewhere. However, the evidence that this probability varies by selectivity of the school of graduation is uncertain, just as it was for New York. There is one mitigating difference between New York and Pennsylvania, and that is there is less variance in the selectivity quartiles of the medical schools. Not only are there only two quartiles represented (Table 6-3), but these two quartiles are relatively close together.

Illinois. The results for Illinois are shown in Table A-6-3. Overall 50.7 percent of the physicians who went to medical school and were born in Illinois were practicing elsewhere. There was a difference of 9.1 percent between physicians with and without a history of government service (statistically significant at $\alpha<.001$). Although there are some differences in the statistics over the different selectivity quartiles, most of the variance was in relatively

small cells.

The statistics for the relationship between the selectivity of the school of graduation and the probability to migrate are also shown in Table A-6-3. In all quartiles (four are represented) there is an indication that the graduates of the more selective schools are more likely to migrate from Illinois. For physicians with a history of government service, the percentages who have left Illinois to practice are: 70.6 for the first quartile, 64.2 for the second, 53.8 for the third, and 40.9 for the fourth. (The percentage differences between the first and fourth quartiles are statistically significant at the 0.001 level.)

For physicians without a history of government service, the relationship between leaving and selectivity of medical school is also monotonic with 64.3 percent of the first quartile and 36.2 percent of the fourth quartile leaving Illinois. (The percentage difference between the first and fourth quartiles is statistically significant at $\alpha<0.001$.)

While 54.3 percent of the physicians with government service left Illinois, 45.2 percent of those without government service did not. This difference of almost ten percent in the percent who leave who have had government service is consistent with the previous finding in both New York and Pennsylvania. Illinois is the first state cited so far, however, which has shown a clear cut propensity for graduates of the more selective schools to leave the state of graduation and birth. The χ^2 statistic for the hypothesis regarding no relationship between place of practice and selectivity of the school of graduation and place of practice and government service

is rejected with a probability of a type 1 error of less than 0.01. (There is one exception and that is for first quartile graduates where the probability of a type 1 error is increased to approximately 0.5.)

Ohio, Georgia, North Carolina and Louisiana. Although Ohio is geographically close to the states listed above, it was included because the medical schools of Ohio, like Illinois, have considerable variance in their selectivity indices. Georgia, North Carolina and Louisiana are included mainly to provide a different geographic base. Of the three southern states listed, both Louisiana and North Carolina have reasonable variance in the selectivity indices while Georgia's two medical schools are relatively close on the index.

The results for these four states are shown in Tables A-6-4 through A-6-7. The overall pattern for these states is consistent with Illinois.

There is a further comment that can be made regarding the southern medical school graduates. The graduates of the southern schools generally have a lower probability of leaving their state than the graduates from the midwestern and north-eastern states listed above. This is a uniform difference of approximately ten to twenty percent, even after allowance for selectivity of the medical school and prior government service.

Summary. For the seven states listed (New York, Pennsylvania, Illinois, Ohio, North Carolina, Georgia, Louisiana), the data presented provide general evidence of these two statements:

1. Physicians with a history of government service have a statistically significant higher probability of leaving

their state of graduation and birth to practice elsewhere. The difference is approximately ten percent.

2. Physicians who graduate from more selective medical schools are more likely to leave their state of graduation and birth to practice elsewhere than are physicians from the less selective medical schools. The difference in probability is approximately four to eight percent per quartile of selectivity of the medical school.

The data for New York state, while consistent with the former statement, are not consistent with the latter. No explanation will be offered at this time, perhaps this is an obvious area for further research.[8] While the Pennsylvania data consistently support the former statement, the latter statement receives only weak support. There is the mitigating circumstance of the closeness of the Pennsylvania medical school selectivity indices.

Californians Attending Medical School Outside California

California is a net importer of physicians based on most any standard. While California schools graduate substantial numbers of physicians, the graduates per population ratio is low relative to the national average. The California production rate in 1967-68 is compared with the national rate in Table 6-4. While the national average was 4.1 per 100,000 population, California's rate was 2.6.

[8] Physicians employed by medical schools were included in the foregoing analysis. Since New York has such a higher number of medical schools, the possibility exists that a high proportion of the first quartile graduates were staying in New York for teaching and research. However, the analysis was repeated excluding medical school faculty and the conclusions were unchanged.

TABLE 6-4

Medical School Graduates Per 100,000 Population in 1967-68 for the U.S. and California

Graduates Per 100,000 Population	Public	Private	Total
U.S.	2.3	1.8	4.1
California	1.5	1.1	2.6

For Source: See Table 1-5.

The differences between California's production rate and the rest of the U.S. in 1967-68 were about equally divided between the public and private sectors of medical education.

Although entry into public medical schools outside California is difficult for Californians, substantial numbers of Californians do attend private medical schools outside their home state. The number of entering students for a sample three-year period 1959-60 to 1961-62 (graduate in 1963-1965) who listed California as place of residence is shown in Table 6-5. These data are from the annual "Education Number" of the Journal of The American Medical Association.

For the three-year period, approximately 1,400 Californians entered medical school somewhere in the U.S. Sixty-two percent of this number entered schools in California while thirty-eight percent (530) entered schools cutside California, primarily in private schools. A reasonable question to ask is, "Where do these Californians who went to medical school outside California go to practice?"

The information available in the biographic history of each physician closest to place of residence is place of birth. As was discussed in Chapter 4, these data are sources of bias and in some

TABLE 6-5

First-Year Medical Students in 1959-60 through 1961-62
Listing California as Place of Residence,
by Location of Medical School[a]

Entered Medical Schools Located in:		Public		Private		Total	
		N	%(down)	N	%(down)	N	%(down)
California	N	474	84.3	399	47.4	873	62.2
	%(across)	54.3		45.7		100.0	
Outside California but in the USA	N	88	15.7	442	52.5	530	37.8
	%(across)	16.6		83.3		100.0	
Total	N	562	100.0	841	100.0	1,403	100.0
	%(across)	40.1		59.9		100.0	

[a]These students would have graduated in 1963-65. Excludes 78 students entering California College of Medicine in 1961-62 (CCM entering students for 1959-60 and 1960-61 not listed in source).

For Source, see footnote at end of Table 4-7.

cases substantial bias. Based on census statistics for native white males, we can state that one of the worst cases is using the number of physicians born in California as the estimate of the number of medical school graduates who would have listed California as place of "high school residence." This is because of the history of the high number of young migrants to California. But the other side of this coin is not so bad. For persons who list California as place of birth, it is more certain that California is also their place of residence than in the former case.[9]

Since many of the medical students in Table 6-5 listing California as place of residence were not born in California, tracing the behavior of those born in California will give a pattern of a subset of Californians. If we assume that the behavior patterns of "resident Californians" do not differ by whether or not they were born here, the pattern of this subset should be a satisfactory predictor of the entire set.

The place of practice for California-born 1955-1965 graduates of private medical schools located outside California is shown in Table 6-6. Physicians still in training and all physicians in federal service are excluded. Overall sixty-four percent of the total were practicing in California in 1971, but the percent returning to California was noticeably dependent on the selectivity of the medical school attended. For first quartile schools, only 52.7

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[9]For example: For native white males age 10-14 in 1960, 32.3 percent of such cohorts in California were born outside California. However, of the native white males age 10-14 born in California, only 13.6 percent were living outside California. For 15-19 year olds, the percentages were 45.5 and 17.0 percent respectively. Source: U.S. Bureau of Census. U.S. Census of Population: 1960. Subject Reports. State of Birth. Final Report (PC(2)-2A. (Washington, D.C., 1963) Tables 26 and 31.

TABLE 6-6

Place of Practice in 1971 for 1955-65 Medical School Graduates Who were Born in California and Attended Private Medical Schools Outside California, by Selectivity of the School of Graduation[a]

Selectivity Quartile of Medical School		Not Practicing in California	Practicing in California	Total
First	N	115	128	243
	%	47.3	52.7	100.0
Second	N	86	126	212
	%	40.6	59.4	100.0
Third	N	24	84	108
	%	22.2	77.8	100.0
Fourth	N	16	90	106
	%	15.1	84.9	100.0
Total	N	241	428	669
	%	36.0	64.0	100.0
χ^2		44.44		
ϕ		0.257		
DF		3		
Significance Level		$\alpha<0.001$		

[a]Based on the 1955-1965 graduates of American medical schools. Excluded are physicians in federal service and in training. Selectivity index based on average science Medical College Admission Test scores of the 1966 entering class. (Unpublished data).

Similar results were obtained when training, federal, academic (teaching and research) administrative physicians were excluded. (Also excluded were physicians whose professional address was other than the 50 states of the U.S. For physicians practicing in California, the percentages by selectivity quartile were 61.8, 65.6, 80.8, 85.8.

percent returned, while for fourth quartile schools 84.9 percent returned, with the overall relationship being positive and monotonic. (The percentage difference between the first and second quartiles is statistically significant at an α level of approximately 0.15, between the first and the third quartiles the percentage difference is statistically significant at $\alpha<.001$.) The null hypothesis of no relationship between selectivity of the school of graduation and the place of practice is rejected at an $\alpha<0.001$.

If academic physicians (research and teaching) are also excluded from the sample, the percentage returning to California is even higher (70.8 percent). The difference in the percentage returning to California (6.8 percent) between this group and the physicians shown in Table 6-6 is concentrated in the first two quartiles. This is consistent with the assumption that more selective schools would tend to produce or attract more academically inclined graduates.

If it is assumed (see footnote 9) that fifteen percent of the medical students born in California were not residents of California at time of matriculation in medical school, the percentage of residents returning to California is substantially higher than that shown in Table 6-6. Finally, it should be noted that the data in Table 6-6 also support the previously discussed notions regarding selectivity of the school of graduation and mobility. The χ^2 statistic shown in Table 6-6 leads to rejection of the hypothesis of no relation between selectivity of the school and place of practice. But the differences by quartile support the hypothesis that the graduates of the more selective schools have more options available to them and are therefore less likely to return to California than are graduates

of the less selective schools.

Some Aspects of the Selectivity of School of Graduation and Migration to California

Included in Chapter 4 was a discussion on the typology of institutional factors and the place of practice. This section will integrate parts of the typology data with the selectivity of the school of graduation as it applies to California. Two questions will be analyzed:

1. "Does the selectivity of the school of graduation affect whether a physician is an intern-resident migrant (typology factor '6') or 'cold turkey' migrant (typology factor '8')?"
2. "Does a history of government service have any effect on the migrant status (category '6' versus category '8') of a physician?"

It should be remembered that all the western states including California are net importers of physicians. In terms of absolute numbers of imported physicians, California has no peers. Of the recent graduate non-federal, non-academic, physicians in direct patient care in California, 68.4 percent were in categories "6" and "8." Category "6" physicians are intern-resident migrants, i.e., they had done graduate training in their state of practice, but were not born there, and had not attended medical school there. Approximately forty-one percent of California's physicians are in this category.

Category "8" physicians are the "cold turkey" migrants. Their state of practice is not equal to the state of any of the three

institutional variables (birth, medical school or graduate training). Approximately twenty-eight percent of California's recent graduates are in this category.

Aside from observing the substantial size of these categories, the question might be asked about how these groups of physicians are divided according to the selectivity of the school of graduation. From the state policy point of view, the question might be asked if state policies attract graduates of more selective schools. For example, are the intern and residency programs in the state successful in attracting the graduates of more selective schools, or are the "cold turkey" migrants more likely to be from the more selective schools?

Again, there is a need to control for a physician's history of government service. As was indicated above, the history of government service does not indicate where a physician served (geographically) but only dates and branch of service. The government service factor is especially important in California, because of the disproportionate number of federal physicians in the state and the subsequent likelihood that ex-federal physicians may have been stationed in California.[10]

The necessary data to evaluate these questions for the 1955-1965 male graduates are shown in Table 6-7. Physicians in federal service, training, teaching, research and administration are excluded. Of the

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[10] In 1963, 12.2 percent of the federal physicians stationed in the U.S. were in California, while California's population was only 9.3 percent of the total U.S. population. Source: C. N. Theodore, J. N. Haug, Selected Characteristics of the Physician Population 1963 and 1967, (American Medical Association, Chicago, 1968) p. 21; and U.S. Bureau of the Census, Statistical Abstract of the United States: 1965 (86th edition) Washington, D.C. 1965, p. 11.

TABLE 6-7

Selectivity of School of Graduation for Category "6" and Category "8" Recent Graduate Male Physicians in California According to Whether or Not They had a History of Government Service[a]

Selectivity of Medical School		Physicians with a History of Government Service			Physicians without a History of Government Service			Total		
		Category "6"	Category "8"	Total	Category "6"	Category "8"	Total	Category "6"	Category "8"	Total
First	N	370	360	730	278	164	442	648	524	1,172
	%	50.7	49.3	100.0	62.9	37.1	100.0	55.3	44.7	100.0
Second	N	465	379	844	419	235	654	884	614	1,498
	%	55.1	44.9	100.0	64.1	35.9	100.0	59.0	41.0	100.0
Third	N	321	244	565	323	156	479	644	400	1,044
	%	56.8	43.2	100.0	67.4	32.6	100.0	61.7	38.3	100.0
Fourth	N	355	272	627	495	285	780	850	557	1,407
	%	56.6	43.4	100.0	63.5	36.5	100.0	60.4	39.6	100.0
Total	N	1,511	1,255	2,766	1,515	840	2,355	3,026	2,095	5,121
	%	54.6	45.4	100.0	64.3	35.7	100.0	59.1	40.9	100.0

χ^2 Statistic (and significance level) between the Null Hypothesis of No Relationship between Category "6" and "8" and the Variable in the Left-Hand Column.

Selectivity of Medical School	Physicians with a History of Government Service	Physicians without a History of Government Service	Total
	χ^2=6.680 α<0.10	χ^2=2.6881 α<0.50	χ^2=11.50 α<0.01

History of Government Service			
First Quartile χ^2=16.59 α<0.001	Second Quartile χ^2=12.26 α<0.001	Third Quartile χ^2=12.37 α<0.001	
Fourth Quartile 6.84 α<0.01		Total χ^2=49.55 α<0.001	

NOTE: Category "6" implies state of practice equals state of graduate training but not equal to state of birth or medical school. Category "8" implies that state of practice does not equal state of birth, medical school or graduate training.

[a]Based on the 1955-1965 graduates of American Medical schools--however, Canadian graduates were inadvertently included in the fourth quartile. Physicians in training, in federal service, in teaching, in research, or doing administrative work excluded.

physicians in categories "6" and "8," approximately sixty percent are in the category "6," with 54.6 percent of those with a government service history and 64.3 percent of those without government service in category "6."

For physicians without a history of government service, there appears to be, at best, a weak relationship between category "6" and "8" and selectivity of the school of graduation. While 62.9 percent of the first quartile graduates are in category "6," 67.4 percent of the third quartile are in category "6." (Percentage difference statistically significant at $\alpha<0.20$.) For the fourth quartile, only 63.5 percent are in category "6." The χ^2 for the null hypothesis of no relationship does not lead to a rejection of the hypothesis.

For physicians with a history of government service, there is evidence of a relationship between selectivity of the school of graduation and category "6" versus category "8." The relationship is most notable in the first quartile where the proportion in both categories is approximately the same. For the remaining quartiles, there is a tendency for physicians to be in category "6" as opposed to category "8." In other words, graduates of first quartile schools are about equally likely to be a "cold turkey migrant" as to be "intern-resident-migrant." This is consistent with the greater mobility for graduates of the more selective schools. Graduates of the less selective schools are more likely to have established contact in the state (via an internship-residency) prior to establishment of a practice, while the graduates of the first quartile schools are more free to choose their place of practice independent of their

choice of location for graduate training.

While the data to support the above conclusions are statistically significant (at reasonable levels of type 1 errors), it should be noted that the percentage differences are still relatively small (5.3 percent between the first quartile and the average of the remainder), and the subsequent implications for state policy are not overwhelming. It is certainly fair to state that the "cold turkey" migrants are from medical schools at least as selective as the "migrants" obtained via internship and residency programs.

The previously observed effect of prior government service is very noticeable again. While 34.7 percent of the physicians without a history of government service are "cold turkey migrants," 45.4 percent of the physicians with a history of government service are in this category ("8"). This result is consistent with the previously discussed increased mobility resulting from government service. Physicians with a history of government service are much more likely than physicians without government service to establish a practice in a location which is not their place of birth, medical school or graduate training. We cannot infer, however, that the place of practice is where they were stationed while in federal service, although it cannot be ruled out either.

This effect of government service is consistent across all quartiles of selectivity and the percentages of differences are statistically significant at an α level of less than 0.001 in all cases. Similarly the χ^2 statistic leads to rejection of the null hypothesis of no relationship for three quartiles at an α level of less than 0.001.

Summary. Whether a migrant physician to California is a type "6" or a type "8" does not appear to have substantial relationship to the selectivity of the school from which he graduated. Therefore, the "cold turkey" migrant is as likely to be from a more selective school as the migrant attracted to the state via graduate training programs.

Physicians who have had a history of government service are much more likely to be "cold turkey" migrants than are physicians without a history of government service. Although there is no information available to show that physicians might ultimately practice where they did their government service, it is reasonable to assume that this is true for some physicians. As a consequence, the stationing of federal physicians in a state may lead to some of these physicians staying in the state after government service.

CHAPTER 7

CONCLUSIONS

1. Physicians and the General Population Movements.

The question of physician migration needs to be considered in the context of the overall demographic, social and economic changes occurring within the U.S. Physician movements are similar to the overall white male migration within the U.S. The general movement of white males to the coasts, to the west and from the midwest, is paralleled by the movement of physicians.

However, the movement of physicians, while similar in some respects to the movement of white males of similar age and education, is also distinctly different. Therefore one cannot just assume that the movement of physicians is no different than that of a similar population and without need of diagnosis.

The distribution of medical schools in the U.S. is most uneven, and the observed movement of physicians is consistent with standard models of labor mobility. If physicians were not reallocating themselves in this manner, then there would be considerable skepticism of the worth of any policy measures designed to affect the distribution of physicians.

2. Typology of Institutional Factors.

An analysis of the biographic history of eleven years of medical school graduates showed that the relationship between place of practice and certain institutional factors is more complex than is commonly believed. There is a substantial portion of the physician population

practicing in states with which they had little or no prior contact. There are also many physicians practicing in states where they took only their graduate training (internships and residencies). These two groups of physicians include over forty percent of the total U.S. stock of recent graduates, and their distribution reflects a very complex pattern of many forces.

When considering institutional factors as policy variables, recognition must be given to the fact that the events in a physician's biographic history are not all independent. Therefore, the tools and policies applied must reflect the true, more complex patterns of behavior.

3. Quantitative Model.

The estimated equations of the migration patterns for type "6" (intern-resident) migrants and type "8" (no previous contact) migrants were consistent with reasonable models of physicians as economic and professional men. Physician movement is toward a reduction of physician income differentials, but the elasticity of migration with respect to physician income is generally low.[1] Physicians are concentrating themselves, preferring to practice where they have colleagues and other non-pecuniary benefits.

Physician migration patterns reflect the competitive effects of local production of medical graduates. This sensitivity to local production appears to be inelastic however. The effects of internship

[1] Using the model to predict changes in the migration patterns of physicians, a change of $10,000 per year in average physician income with no change in the migration of white males generated only 44 new physicians for California. This result should be considered most tentatively because of the large standard error of the coefficient on physician income in several of the equations.

and residency programs on the location of physicians is uncertain, but the evidence does not show it to be a very strong relationship in either case. Whether or not medical teaching institutions compete with local physicians is also unclear. If there is competition between the two, the relationship does not appear to be strong.

4. Policy Simulations.

The equations estimated in Chapter 5 were used to predict the effects of two policy changes on the local distribution of physicians. The policies tested were what effect would an increase of one hundred public medical school graduates per year or an increase of one hundred non-foreign house staff per year in a particular state have upon the number of physicians locating in that state per year.

It was assumed that the migration of white males to and from the state were held constant at the 1955-1960 level, and that this was a unilateral change in one state's policies with other states making no change in policy. Both policies were simulated using coefficients and scaling factors (see below) from the model of "public and private graduates" and from the model of "public graduates only." The results are based on the aggregated changes in type "6" and type "8" migrants. In other words, the results are the sums of the changes per year of the in- and out-migration of family practice and specialist physicians.

Besides the changes in the type "6" and "8" migrant flows, a separate set of estimates were presented which assume that the other categories of physician migrants[2] in/from the state are similar in

[2]Other categories refer to other typology factors. See Appendix 7 for calculation of the scaling factors.

behavior to the type "6" and type "8" physicians. In effect, the basic estimates of in-/out-migration for each state were scaled up by the ratio of the total physician migrants to the sum of type "6" and type "8" migrants for that state.

The results for a change in public medical school graduates are shown in Tables 7-1 and 7-2. If only the loss (reduced flow-in plus increased flow-out) of type "6" and type "8" physicians are considered (Table 7-1), states would have a net benefit of approximately sixty to eighty physicians per year for an increase in production of one hundred public school graduates per year.

When the possible losses of other migrants are considered (Table 7-2), the net benefit decreases to approximately fifty to eighty new physicians per year. It should be observed, however, that the scaling factors are not uniform and the relative positions of states changes between Tables 7-1 and 7-2.

Some observations about the results shown in Tables 7-1 and 7-2:

1. The relative positions of some states should be of concern to national policy-makers. There is a low relative benefit to many states that already have low physician population ratios. For example, Nebraska and Kansas both had a physician per 100,000 population ratio of 115 in 1970 which was significantly below the national average of 148. And both of these states are very low on the rankings of net benefits from an increase in local medical school graduates.

2. The absolute values reported should be considered tentative estimates. There are at least two reasons to be cautious in interpreting the results. First, the validity of physician income data is not only uncertain, but the equation specified does not allow for dynamic changes in physician income as the production of graduates increases. The second

TABLE 7-1

The Sum of the Additional Flow Out and the Reduced Flow In of Type "6" and Type "8" Migrants Resulting from an Increase of One Hundred Public Medical School Graduates from Medical Schools in the State [a]

State	Estimate Based on the Migration Equations of ... Medical School Graduates		Average
	Public and Private	Public Only	
Alabama	18.69	18.31	18.50
Arizona	46.41	31.20	38.81
Arkansas	27.52	28.94	28.23
California	23.64	15.17	19.40
Colorado	41.15	35.90	38.52
Connecticut	20.89	18.86	19.88
Delaware	30.38	25.21	27.80
Florida	40.52	22.22	31.37
Georgia	21.50	20.39	20.94
Illinois	19.27	20.36	19.81
Indiana	22.09	22.66	22.37
Iowa	22.78	26.47	24.62
Kansas	37.13	40.17	38.65
Kentucky	24.64	27.45	26.05
Louisiana	15.91	14.77	15.34
Maryland	26.48	22.50	24.49
Massachusetts	18.47	19.46	18.97
Michigan	15.47	17.77	16.62
Minnesota	19.09	19.62	19.36
Mississippi	18.79	18.28	18.54
Missouri	24.68	25.33	25.00
Nebraska	30.65	34.85	32.75
New Hampshire	29.93	26.84	28.39
New Jersey	20.08	17.55	18.81
New York	13.08	15.92	14.50
North Carolina	18.41	18.10	18.26
Ohio	18.02	18.56	18.29
Oklahoma	33.13	35.01	34.07
Oregon	33.54	32.47	33.00
Pennsylvania	14.37	17.22	15.79
Rhode Island	30.08	30.03	30.05
South Carolina	21.11	19.15	20.13
Tennessee	22.73	23.79	23.26
Texas	21.35	20.62	20.98
Virginia	30.61	27.03	28.81
Washington	34.07	31.22	32.65
West Virginia	27.22	35.15	31.19
Wisconsin	16.36	16.95	16.66

[a]Assuming that only one state increases the number of graduates.

TABLE 7-2

The Estimates Shown in Table 7-1 (Results of an Increase in Public Medical School Graduates) Inflated by the Ratio of Total Physician Migrants to the Sum of Type "6" and Type "8" Migrants[a]

State	Estimate Based on the Migration Equations of ... Medical School Graduates		Average
	Public and Private	Public Only	
Alabama	23.25	19.57	21.41
Arizona	59.20	†	†
Arkansas	40.35	30.36	35.35
California	29.62	17.31	23.46
Colorado	52.02	40.52	46.27
Connecticut	25.38	†	†
Delaware	33.68	†	†
Florida	51.35	26.14	38.74
Georgia	29.62	21.53	25.58
Illinois	27.16	20.88	24.01
Indiana	30.02	23.90	26.96
Iowa	29.37	28.28	28.82
Kansas	49.53	46.51	48.02
Kentucky	33.33	30.06	31.69
Louisiana	28.57	15.78	22.18
Maryland	31.70	28.19	29.95
Massachusetts	23.39	†	†
Michigan	19.89	19.12	19.50
Minnesota	24.09	20.57	22.33
Mississippi	25.09	20.13	22.61
Missouri	35.66	26.61	31.14
Nebraska	56.63	37.47	47.05
New Hampshire	34.65	†	†
New Jersey	24.41	†	†
New York	16.97	17.44	17.20
North Carolina	24.37	18.85	21.61
Ohio	22.69	18.90	20.80
Oklahoma	48.82	36.63	42.73
Oregon	42.07	37.92	39.99
Pennsylvania	19.20	†	†
Rhode Island	35.90	†	†
South Carolina	28.34	20.82	24.58
Tennessee	35.53	30.07	32.80
Texas	29.37	21.82	25.60
Virginia	39.41	33.14	36.28
Washington	43.09	34.92	39.01
West Virginia	35.87	38.06	36.96
Wisconsin	20.51	18.31	19.41

[a]See Appendix A-7 for the ratios used.

†State has no public medical schools.

TABLE 7-3

Sum of the Additional Flow In and Reduced Flow Out of Type "6" and Type "8" Migrants Resulting from an Increase of One Hundred Non-Foreign House Staff on Duty in the State

State	Estimate Based on the Migration Equations of ... Medical School Graduates		Average
	Public and Private	Public Only	
Alabama	3.81	-3.69	0.06
Arizona	10.21	-4.11	3.05
Arkansas	5.50	-6.13	-3.16
California	5.24	-1.84	1.70
Colorado	8.61	-6.56	1.03
Connecticut	4.34	-3.55	0.39
Delaware	6.43	-4.38	1.02
Florida	9.18	-1.81	3.68
Georgia	4.41	-4.00	0.21
Illinois	3.85	-4.32	-0.24
Indiana	4.44	-4.72	-0.14
Iowa	4.42	-5.96	-0.77
Kansas	7.36	-8.66	-0.65
Kentucky	4.84	-6.03	-0.59
Louisiana	3.28	-2.85	0.22
Maryland	5.58	-4.01	0.78
Massachusetts	3.69	-4.13	-0.22
Michigan	3.01	-3.97	-0.48
Minnesota	3.84	-4.09	-0.12
Mississippi	3.83	-3.66	0.09
Missouri	4.96	-5.28	-0.16
Nebraska	5.99	-7.75	-0.88
New Hampshire	6.23	-5.03	0.60
New Jersey	4.20	-3.21	0.49
New York	2.50	-3.67	-0.59
North Carolina	3.74	-3.65	0.04
Ohio	3.62	-3.87	-0.13
Oklahoma	6.61	-7.44	-0.41
Oregon	6.85	-6.48	0.19
Pennsylvania	2.76	-3.94	-0.59
Rhode Island	6.09	-6.13	-0.02
South Carolina	4.38	-3.62	0.37
Tennessee	4.55	-5.02	-0.24
Texas	4.36	-4.10	0.13
Virginia	6.39	-4.99	0.70
Washington	7.05	-5.96	0.54
West Virginia	5.09	-8.36	-1.64
Wisconsin	3.28	-3.55	-0.14

TABLE 7-4

The Numeric Estimates Shown in Table 7-3 (Results of an Increase in House Staff on Duty) Inflated by the Ratio of Total Physician Migrants to the Sum of Type "6" and Type "8" Migrants[a]

State	Estimate Based on the Migration Equations of ... Medical School Graduates		Average
	Public and Private	Public Only	
Alabama	4.67	-3.89	0.39
Arizona	1.23	†	†
Arkansas	8.25	-6.21	1.02
California	6.50	-2.36	2.07
Colorado	10.70	-7.75	1.47
Connecticut	5.15	†	†
Delaware	6.96	†	†
Florida	11.35	-2.69	4.33
Georgia	6.19	-4.15	1.02
Illinois	5.53	-4.31	0.61
Indiana	6.18	-5.02	0.58
Iowa	5.79	-6.29	-0.25
Kansas	9.90	-10.14	-0.12
Kentucky	6.57	-6.50	0.04
Louisiana	6.26	-3.08	1.59
Maryland	6.67	-5.46	0.60
Massachusetts	4.75	†	†
Michigan	3.94	-4.31	-0.19
Minnesota	4.82	-4.25	0.28
Mississippi	5.06	-3.32	0.87
Missouri	7.20	-5.15	1.03
Nebraska	12.08	-8.35	1.87
New Hampshire	6.99	†	†
New Jersey	4.93	†	†
New York	3.32	-3.87	-0.27
North Carolina	4.97	-3.72	0.63
Ohio	4.58	-3.79	0.39
Oklahoma	9.87	-7.58	1.15
Oregon	8.61	-7.93	0.34
Pennsylvania	3.82	†	†
Rhode Island	7.04	†	†
South Carolina	5.90	-3.89	1.06
Tennessee	7.48	-6.62	0.43
Texas	6.11	-4.31	0.90
Virginia	8.35	-6.56	0.90
Washington	8.84	-6.84	1.00
West Virginia	6.55	-7.12	-0.28
Wisconsin	4.14	-3.86	-0.14

[a]See Appendix A-7 for the ratios used.

†State has no public medical schools.

reason for considering these results tentative is the realistic acknowledgment that the coefficients used, while generally having reasonable standard errors, are an average value for all states.

The results for a change of one hundred house staff on duty are shown in Tables 7-3 and 7-4. Consistent with the discussion of Chapter 5, the consequences of such a policy change are rather small in terms of the number of additional physicians locating in the state. However, the words of caution in interpreting the results noted above in item "2" above should be repeated.

The consistency of the results from the two models is encouraging and gives some credence to the relative positions of states. Finally, the relative costs of these two policies is left for others to estimate.

5. Californians Going to Medical School Outside California.

Chapter 6 showed that substantial numbers of Californians attend medical school outside California and then return to the state to practice. The percentage returning depends on the selectivity of the medical school attended with a significantly higher percentage of graduates from the less selective schools returning. Overall, upwards of eighty percent of the Californians return to practice in California.

Presumably, similar patterns exist in other states. Therefore one of the issues for public officials considering expansion of public medical schools is who will attend the school. If a state builds a medical school and students who would have otherwise attended a private school and then returned to practice in the state, instead attend a public school in state, there is no benefit to the state in terms of additional physicians. There certainly is the benefit to

the student, who now receives his medical education at public subsidy instead of from private resources.

6. Selectivity of the Medical School and a History of Government Service.

The results of Chapter 6 also show that two factors, readily identifiable in the biographic history, have a statistical relationship to the probability of migrating "out." These two factors are a history of government service and the selectivity of the school of graduation.

Physicians with a history of government service have an approximately ten percent higher probability of migrating "out" from their place of medical school and birth. With the exception of New York, graduates of schools from a sample of seven states show a statistically significant relationship between the selectivity of the school of graduation and the probability of leaving their home state. Graduates of more selective schools are more likely to leave their home state than are the graduates of less selective schools.

Both the government service and the selectivity factors have an import on federal policy. Since government service increases mobility, this may provide one avenue of more directed relocation of physicians. It is not known how many physicians are practicing where they did federal service, and the question is probably worthy of further research. But it is at least reasonable to suppose that the time in federal service could provide an opportunity for at least information dissemination on the needs and demands of certain areas. Secondly, federal policy-makers should recognize that any policy of required federal service (either similar to the present

system or one even more coercive) will likely have many unforeseen location changes in stock of physicians.

Another important consideration to federal policy is the subsidy to medical schools. One of the effects of more selective medical schools (and possibly more professionally oriented education) is the higher risk of losing such graduates. Therefore, state policies are liable to result in a design which would keep medical schools unselective, so as to keep the graduates home. This is possibly rational state policy but would appear to present a case for federal intervention on behalf of a wider national interest in better health care.

APPENDIX A-1

TABLE A-1-1

Rate of "Out Migration" Between Division of Graduation and Division of Practice For the 1955-1965 Public School Graduates of American Medical Schools[a] (Percent)

Division of Graduation	Division of Practice									% Who Stayed to Practice in Division of Graduation[b]	% Who Left to Practice in Another Division[c]
	N.E.	M.A.	E.N.C.	W.N.C.	S.A.	E.S.C.	W.S.C.	MT.	PAC.		
New England	56.1	19.4	2.0	3.4	5.4	0.4	1.0	1.7	10.5	56.1	43.9
Middle Atlantic	7.3	64.0	4.0	1.2	7.3	0.3	0.7	2.1	13.1	64.0	36.0
East North Central	1.3	2.3	62.7	3.1	4.7	0.8	1.8	5.3	18.0	62.7	37.3
West North Central	1.0	1.6	7.1	53.9	2.5	0.5	3.4	8.7	21.3	53.9	46.1
South Atlantic	2.4	4.6	3.2	1.1	76.8	2.6	2.0	2.1	5.5	76.8	23.2
East South Central	0.5	1.3	1.1	2.7	13.4	65.5	8.7	2.5	4.3	65.5	34.5
West South Central	0.5	0.8	1.3	3.2	3.7	2.4	77.4	26.4	37.5	77.4	22.6
Mountain	0.4	2.0	2.8	2.4	1.7	0	1.8	62.5	26.4	62.5	37.5
Pacific	0.8	1.1	1.2	2.1	0.9	0.2	0.5	6.3	86.9	86.9	13.1

[a]Excludes physicians in training, government service, teaching, research, administration, and physicians whose professional address is other than the fifty states of the U.S. Also excluded are the pre-1963 graduates of the California College of Medicine. Out migration rate is (the number of physicians leaving/local production) x 100. Net migration is (the net migrants/local production) x 100.

[b]Diagonal element.

[c]Sum of off diagonal elements.

TABLE A-1-2

Rate of "Net Migration" Between Division of Graduation and Division of Practice For the 1955-1965 Public School Graduates of American Medical Schools[a] (Percent)

Division of Graduation	Division of Practice									Net Migration as a Percent of Local Production
	N.E.	M.A.	E.N.C.	W.N.C.	S.A.	E.S.C.	W.S.C.	MT.	PAC.	
New England		28.6	24.5	7.4	23.4	3.4	5.7	-0.3	- 5.4	87.1
Middle Atlantic	-4.3		2.7	1.4	1.0	1.2	0.9	-1.1	-12.0	-10.0
East North Central	-1.2	-0.9		0.9	-2.6	-0.3	-0.8	-4.9	-17.6	-27.7
West North Central	-0.6	-0.8	-1.6		-1.4	-1.3	0.3	-8.0	-20.1	-31.1
South Atlantic	-1.9	-0.5	4.3	1.3		5.8	1.9	-1.7	- 5.0	4.3
East South Central	-0.4	-1.1	1.0	-2.0	-9.2		-4.5	-2.5	- 4.1	-23.1
West South Central	-0.4	-0.4	1.3	-0.2	-1.8	-2.6		-3.7	- 6.3	- 9.1
Mountain	0.1	2.5	31.9	29.5	6.8	6.3	16.0		-13.3	80.4
Pacific	0.8	12.8	56.1	36.3	9.8	5.1	13.4	6.5		141.2

See Table A-1-1 for footnote.

TABLE A-1-3

Rate of "Out Migration" Between Division of Graduation and Division of Practice
For the 1955-1965 Private School Graduates of American Medical Schools[a] (Percent)

Division of Graduation	Division of Practice									% Who Stayed to Practice in Division of Graduation[b]	% Who Left to Practice in Another Division[c]
	N.E.	M.A.	E.N.C.	W.N.C.	S.A.	E.S.C.	W.S.C.	MT.	PAC.		
New England	50.2	16.2	4.4	2.3	6.6	0.9	1.7	3.0	14.7	50.2	49.8
Middle Atlantic	10.0	54.6	5.2	1.9	9.1	0.8	1.5	3.1	13.8	54.6	45.4
East North Central	3.0	12.4	41.6	5.4	6.5	1.4	2.1	5.4	22.2	41.6	58.4
West North Central	3.4	7.0	15.8	27.0	5.1	1.6	3.9	8.6	27.6	27.0	73.0
South Atlantic	6.6	15.7	6.4	1.7	47.6	3.2	2.4	3.1	13.3	47.6	52.4
East South Central	1.4	6.4	13.6	3.5	14.7	42.4	5.4	1.5	11.1	42.4	57.6
West South Central	0.7	2.9	3.6	4.1	12.0	11.6	47.7	5.8	11.6	47.7	52.3
Pacific	1.4	1.7	4.1	1.6	4.1	1.2	1.0	5.2	79.7	79.7	20.3

See Table A-1-1 for footnotes.

TABLE A-1-4

Rate of Net Migration" Between Division of Graduation and Division of Practice
For the 1955-1965 Private School Graduates of American Medical Schools[a] (Percent)

Division of Graduation	Division of Practice									Net Migration as a Percent of Local Production
	N.E.	M.A.	E.N.C.	W.N.C.	S.A.	E.S.C.	W.S.C.	MT.	PAC.	
New England		2.16	1.1	0.4	4.9	0.0	-1.2	-2.9	-13.7	10.2
Middle Atlantic	-5.7		0.8	-0.3	-1.7	0.2	-0.9	-3.0	-13.5	-24.2
East North Central	-0.6	-1.8		1.5	-0.4	3.4	-0.8	-5.3	-20.7	-24.8
West North Central	-0.6	1.7	-3.4		-1.4	1.1	-0.7	-8.5	-26.2	-38.2
South Atlantic	-2.7	3.6	0.4	0.6		2.3	1.9	-3.1	-11.6	- 8.6
East South Central	0.0	-1.5	-9.7	-1.4	-6.1		5.7	-1.4	-9.8	-24.6
West South Central	1.8	5.7	2.3	0.9	-5.3	-5.9		-5.8	-10.5	-16.7
Pacific	20.0	74.1	56.2	31.5	30.0	9.5	9.8	-5.2		226.2

See Table A-1-1 for footnote.

TABLE A-1-5

Rate of "Out Migration" Between Division of Graduation and Division of Practice
For the 1955-1965 Total Graduates of American Medical Schools[a] (Percent)

Division of Graduation	Division of Practice									% Who Stayed to Practice in Division of Graduation[b]	% Who Left to Practice in Another Division[c]
	N.E.	M.A.	E.N.C.	W.N.C.	S.A.	E.S.C.	W.S.C.	MT.	PAC.		
New England	50.9	16.5	4.2	2.5	6.5	0.8	1.6	2.8	14.2	50.9	49.1
Middle Atlantic	9.5	56.4	5.0	1.8	8.7	0.7	1.3	2.9	13.7	56.4	43.6
East North Central	2.0	6.5	53.9	4.1	5.4	1.1	1.9	5.4	19.8	53.9	46.1
West North Central	1.8	3.5	10.2	44.4	3.4	0.9	3.6	8.6	23.5	44.4	55.6
South Atlantic	4.6	10.4	4.9	1.4	61.4	2.9	2.2	2.7	9.6	61.4	38.6
East South Central	0.9	3.3	6.1	3.0	13.9	56.3	7.4	2.1	7.0	56.3	43.7
West South Central	0.6	1.4	1.9	3.4	5.9	4.9	69.3	4.6	7.9	69.3	30.7
Mountain	0.4	2.0	2.8	2.4	1.7	0.0	1.8	62.5	26.4	62.5	37.5
Pacific	1.1	1.5	2.4	1.9	2.3	0.6	0.8	5.7	83.8	83.8	16.2

See Table A-1-1 for footnotes.

TABLE A-1-6

Rate of Net Migration" Between Division of Graduation and Division of Practice
For the 1955-1965 Total Graduates of American Medical Schools[a] (Percent)

Division of Graduation	Division of Practice									Net Migration as a Percent of Local Production
	N.E.	M.A.	E.N.C.	W.N.C.	S.A.	E.S.C.	W.S.C.	MT.	PAC.	
New England		22.3	3.8	1.3	7.1	0.4	-0.3	-2.6	-12.7	19.1
Middle Atlantic	-5.4		1.2	0.0	-1.1	0.4	-0.6	-2.7	-13.1	-21.5
East North Central	-0.9	-1.2		1.2	-1.7	1.2	-0.8	-5.1	-18.9	-26.5
West North Central	-0.6	0.6	-2.3		-1.4	1.3	0.0	-8.2	-22.2	-33.5
South Atlantic	-2.3	1.6	2.3	0.9		3.9	1.9	-2.4	- 8.5	- 2.5
East South Central	-0.2	-1.2	-3.2	-1.7	-8.0		-0.4	2.1	- 6.4	-23.7
West South Central	0.1	1.2	1.6	0.0	-2.7	0.3		-4.2	- 7.4	-11.1
Mountain	7.5	31.3	57.0	47.3	20.6	8.8	25.3		- 3.7	194.4
Pacific	9.1	37.7	53.5	32.4	18.1	6.7	11.1	0.9		171.0

See Table A-1-i for footnote.

APPENDIX A-2

TABLE A-2

Typology of Institutional Factors for the State of Practice for the 1955-1965 Graduates of American Medical Schools[a]

DIVISION OF PRACTICE		TYPOLOGY FACTOR								
New England		1	2	3	4	5	6	7	8	Total
State of Practice = State of Medical School		yes	yes	yes	yes					
State of Practice = State of Graduate Training		yes	yes			yes	yes			
State of Practice = State of Birth		yes			yes	yes		yes		
STATE OF PRACTICE										
Maine	N	0	0	0	0	27	41	18	85	171
	%	0	0	0	0	15.8	24.0	10.5	49.7	100.0
New Hampshire	N	0	0	0	0	5	21	34	101	161
	%	0	0	0	0	3.1	13.0	21.1	62.7	100.0
Vermont	N	11	10	8	11	0	24	3	44	111
	%	9.9	9.0	7.2	9.9	0	21.6	2.7	39.6	100.0
Massachusetts	N	375	226	41	54	204	410	65	289	1,664
	%	22.5	13.6	2.5	3.2	12.3	24.6	3.9	17.4	100.0
Rhode Island	N	0	0	0	0	45	36	32	54	167
	%	0	0	0	0	26.9	21.6	19.2	32.3	100.0
Connecticut	N	30	33	20	11	136	241	68	366	905
	%	3.3	3.6	2.2	1.2	15.0	26.6	7.5	40.4	100.0
Total	N	416	269	69	76	390	773	220	919	3,179
	%	13.1	8.5	2.2	2.4	12.3	24.3	6.9	28.9	100.0

See end of table for footnote.

TABLE A-2 (continued)

Typology of Institutional Factors for the State of Practice for the 1955-1965 Graduates of American Medical Schools[a]

DIVISION OF PRACTICE		TYPOLOGY FACTOR								
East North Central		1	2	3	4	5	6	7	8	Total
State of Practice = State of Medical School		yes	yes	yes	yes					
State of Practice = State of Graduate Training		yes	yes			yes	yes			
State of Practice = State of Birth		yes			yes	yes		yes		
STATE OF PRACTICE										
Ohio	N	767	156	22	84	233	399	60	230	1,951
	%	39.3	8.0	1.1	4.3	11.9	20.5	3.1	11.8	100.0
Indiana	N	389	120	31	98	19	68	39	222	986
	%	39.5	12.2	3.1	9.9	1.9	6.9	4.0	22.5	100.0
Illinois	N	797	245	28	71	91	190	70	294	1,786
	%	44.6	13.7	1.6	4.0	5.1	10.6	3.9	16.5	100.0
Michigan	N	771	214	20	51	98	420	21	147	1,742
	%	44.3	12.3	1.1	2.9	5.6	24.1	1.2	8.4	100.0
Wisconsin	N	305	99	32	115	23	161	44	285	1,064
	%	28.7	9.3	3.0	10.8	2.2	15.1	4.1	26.8	100.0
Total	N	3,029	834	133	419	464	1,238	234	1,178	7,529
	%	40.2	11.1	1.8	5.6	6.2	16.4	3.1	15.6	100.0

See end of table for footnote.

TABLE A-2 (continued)

Typology of Institutional Factors for the State of Practice
for the 1955-1965 Graduates of American Medical Schools[a]

DIVISION OF PRACTICE		TYPOLOGY FACTOR								
Middle Atlantic		1	2	3	4	5	6	7	8	Total
State of Practice = State of Medical School		yes	yes	yes	yes					
State of Practice = State of Graduate Training		yes	yes			yes	yes			
State of Practice = State of Birth		yes			yes	yes		yes		
STATE OF PRACTICE										
New York	N	1,894	427	32	106	777	631	109	266	4,242
	%	44.6	10.1	.8	2.5	18.3	14.9	2.6	6.3	100.0
New Jersey	N	59	18	8	9	288	185	252	699	1,518
	%	3.9	1.2	.5	.6	19.0	12.2	16.6	46.0	100.0
Pennsylvania	N	1,494	290	25	87	159	295	37	202	2,589
	%	57.7	11.2	1.0	8.4	6.1	11.4	1.4	7.8	100.0
Total	N	3,447	735	65	202	1,224	1,111	398	1,167	8,349
	%	41.3	8.8	.8	2.4	14.7	13.3	4.8	14.0	100.0

See end of table for footnote.

TABLE A-2 (continued)

Typology of Institutional Factors for the State of Practice for the 1955-1965 Graduates of American Medical Schools[a]

DIVISION OF PRACTICE		TYPOLOGY FACTOR								
West North Central		1	2	3	4	5	6	7	8	Total
State of Practice = State of Medical School		yes	yes	yes	yes					
State of Practice = State of Graduate Training		yes	yes			yes	yes			
State of Practice = State of Birth		yes			yes	yes		yes		
STATE OF PRACTICE										
Minnesota	N	297	82	20	78	71	278	23	180	1,029
	%	28.9	8.0	1.9	7.6	6.9	27.0	2.2	17.5	100.0
Iowa	N	141	37	24	71	19	53	27	92	464
	%	30.4	8.0	5.2	15.3	4.1	11.4	5.8	19.8	100.0
Missouri	N	217	137	32	46	68	182	47	173	902
	%	24.1	15.2	3.5	5.1	7.5	20.2	5.2	19.2	100.0
North Dakota	N	0	0	0	0	15	2	49	63	129
	%	0	0	0	0	11.6	1.6	38.0	48.8	100.0
South Dakota	N	0	0	0	0	10	9	41	62	122
	%	0	0	0	0	8.2	7.4	33.6	50.8	100.0
Nebraska	N	156	67	16	43	2	8	7	37	336
	%	46.4	19.9	4.8	12.8	.6	2.4	2.1	11.0	100.0
Kansas	N	130	48	27	82	13	74	18	115	507
	%	25.6	9.5	5.3	16.2	2.6	14.6	3.6	22.7	100.0
Total	N	941	371	119	320	198	606	212	722	3,489
	%	26.9	10.6	3.4	9.2	5.7	17.4	6.1	20.7	100.0

See end of table for footnote.

TABLE A-2 (continued)

Typology of Institutional Factors for the State of Practice for the 1955-1965 Graduates of American Medical Schools[a]

DIVISION OF PRACTICE		TYPOLOGY FACTOR								
South Atlantic		1	2	3	4	5	6	7	8	Total
State of Practice = State of Medical School Graduate Training Birth		yes yes yes	yes yes	yes	yes yes	yes yes	yes	yes		
STATE OF PRACTICE										
Delaware	N	0	0	0	0	8	27	7	43	85
	%	0	0	0	0	9.4	31.8	8.2	50.6	100.0
Maryland	N	192	94	18	13	29	153	16	432	947
	%	20.3	9.9	1.9	1.4	3.1	16.2	1.7	45.6	100.0
District of Columbia	N	25	113	12	8	8	108	6	85	365
	%	6.8	31.0	3.3	2.2	2.2	29.6	1.6	23.3	100.0
Virginia	N	273	136	49	75	12	98	23	377	1,043
	%	26.2	13.0	4.7	7.2	1.2	9.4	2.2	36.1	100.0
West Virginia	N	18	3	3	7	34	11	48	57	181
	%	9.9	1.7	1.7	3.9	18.8	6.1	26.5	31.5	100.0
North Carolina	N	293	102	41	178	31	137	46	276	1,104
	%	26.5	9.2	3.7	16.1	2.8	12.4	4.2	25.0	100.0
South Carolina	N	252	45	11	68	14	36	23	119	568
	%	44.4	7.9	1.9	12.0	2.5	6.3	4.0	21.0	100.0
Georgia	N	398	165	23	97	34	134	33	246	1,130
	%	35.2	14.6	2.0	8.6	3.0	11.9	2.9	21.8	100.0
Florida	N	114	160	57	62	78	699	126	680	1,976
	%	5.8	8.1	2.9	3.1	3.9	35.4	6.4	34.4	100.0
Total	N	1,565	818	214	508	248	1,403	328	2,315	7,399
	%	21.2	11.1	2.9	6.9	3.3	19.0	4.4	31.3	100.0

See end of table for footnote.

TABLE A-2 (continued)

Typology of Institutional Factors for the State of Practice
for the 1955-1965 Graduates of American Medical Schools[a]

DIVISION OF PRACTICE		TYPOLOGY FACTOR								
East South Central		1	2	3	4	5	6	7	8	Total
State of Practice = State of Medical School		yes	yes	yes	yes					
State of Practice = State of Graduate Training		yes	yes			yes	yes			
State of Practice = State of Birth		yes			yes	yes		yes		
STATE OF PRACTICE										
Kentucky	N	221	51	24	134	24	33	56	160	703
	%	31.4	7.3	3.4	19.1	3.4	4.7	8.0	22.8	100.0
Tennessee	N	428	166	39	83	11	69	16	137	949
	%	45.1	17.5	4.1	8.7	1.2	7.3	1.7	14.4	100.0
Alabama	N	282	34	5	56	27	58	63	181	706
	%	39.9	4.8	.7	7.9	3.8	8.2	8.9	25.6	100.0
Mississippi	N	102	18	15	84	42	22	110	105	498
	%	20.5	3.6	3.0	16.9	8.4	4.4	22.1	21.2	100.0
Total	N	1,033	269	83	357	104	182	245	583	2,856
	%	36.2	9.4	2.9	12.5	3.6	6.4	8.6	20.4	100.0

See end of table for footnote.

TABLE A-2 (continued)
Typology of Institutional Factors for the State of Practice
for the 1955-1965 Graduates of American Medical Schools[a]

DIVISION OF PRACTICE		TYPOLOGY FACTOR								
West South Central		1	2	3	4	5	6	7	8	Total
State of Practice = State of Medical School Graduate Training Birth		yes yes yes	yes yes	yes	yes yes	yes yes	yes	yes		
STATE OF PRACTICE										
Arkansas	N	183	52	13	79	9	10	21	91	458
	%	40.0	11.4	2.8	17.2	2.0	2.2	4.6	19.9	100.0
Louisiana	N	529	179	21	50	7	80	16	73	955
	%	55.4	18.7	2.2	5.2	.7	8.4	1.7	7.6	100.0
Oklahoma	N	249	66	21	66	20	48	33	103	606
	%	41.1	10.9	3.5	10.9	3.3	7.9	5.4	17.0	100.0
Texas	N	1,116	343	64	230	73	329	74	487	2,716
	%	41.1	12.6	2.4	8.5	2.7	12.1	2.7	17.9	100.0
Total	N	2,077	640	119	425	109	467	144	754	4,735
	%	43.9	13.5	2.5	9.0	2.3	9.9	3.0	15.9	100.0

See end of table for footnote.

TABLE A-2 (continued)
Typology of Institutional Factors for the State of Practice
for the 1955-1965 Graduates of American Medical Schools[a]

DIVISION OF PRACTICE		TYPOLOGY FACTOR								
Mountain		1	2	3	4	5	6	7	8	Total
State of Practice = State of Medical School / Graduate Training / Birth		yes yes yes	yes yes	yes	yes yes	yes yes	yes	yes		
STATE OF PRACTICE										
Montana	N	0	0	0	0	0	0	41	149	190
	%	0	0	0	0	0	0	21.6	78.4	100.0
Idaho	N	0	0	0	0	0	0	51	131	182
	%	0	0	0	0	0	0	28.0	72.0	100.0
Wyoming	N	0	0	0	0	0	110	18	75	203
	%	0	0	0	0	0	54.2	8.9	36.9	100.0
Colorado	N	90	79	22	43	17	294	11	310	866
	%	10.4	9.1	2.5	5.0	2.0	33.9	1.3	35.8	100.0
New Mexico	N	0	0	0	0	6	39	11	175	231
	%	0	0	0	0	2.6	16.9	4.8	75.8	100.0
Arizona	N	0	0	0	0	25	144	38	422	629
	%	0	0	0	0	4.0	22.9	6.0	67.1	100.0
Utah	N	87	38	8	33	35	57	15	45	318
	%	27.4	11.9	2.5	10.4	11.0	17.9	4.7	14.2	100.0
Nevada	N	0	0	0	0	0	0	4	168	172
	%	0	0	0	0	0	0	2.3	97.7	100.0
Total	N	177	117	30	76	83	644	189	1,475	2,791
	%	6.3	4.2	1.1	2.7	3.0	23.1	6.8	52.8	100.0

See end of table for footnote.

TABLE A-2 (continued)
Typology of Institutional Factors for the State of Practice
for the 1955-1965 Graduates of American Medical Schools[a]

DIVISION OF PRACTICE		TYPOLOGY FACTOR								
Pacific and Total U.S.		1	2	3	4	5	6	7	8	Total
State of Practice = State of Medical School / Graduate Training / Birth		yes yes yes	yes yes	yes	yes yes	 yes yes	yes	 yes		
STATE OF PRACTICE										
Washington	N	70	81	49	53	62	257	32	349	953
	%	7.3	8.5	5.1	5.6	6.5	27.0	3.4	36.6	100.0
Oregon	N	91	88	28	45	15	173	8	266	714
	%	12.7	12.3	3.9	6.3	2.1	24.2	1.1	37.3	100.0
California	N	854	1,034	95	65	384	3,222	68	2,189	7,911
	%	10.8	13.1	1.2	.8	4.9	40.7	.9	27.7	100.0
Alaska	N	0	0	0	0	0	0	3	83	86
	%	0	0	0	0	0	0	3.5	96.5	100.0
Hawaii	N	0	0	0	0	33	72	86	65	256
	%	0	0	0	0	12.9	28.1	33.6	25.4	100.0
Total	N	1,015	1,203	172	163	494	3,724	197	2,952	9,920
	%	10.2	12.1	1.7	1.6	5.0	37.5	2.0	29.8	100.0
Total U.S.	N	13,700	5,256	1,004	2,546	3,341	10,155	2,167	12,087	50,256
	%	27.3	10.5	2.0	5.1	6.6	20.2	4.3	24.1	100.0

[a]Based on the 1955-1965 graduates of U.S. medical schools (and Canadian graduates practicing in the U.S.). Excluded are physicians in training, in federal service, in teaching, research, and administration. Also excluded are physicians whose professional address is other than the fifty states of the U.S. and the pre-1963 graduates of the California College of Medicine.

APPENDIX A-3

DATA

DATA:

The basic data set is the biographic sketches of the 1955 to 1965 graduates of American and Canadian medical schools) approximately 78,000 physicians).[1] The graduates of Canadian schools were not generally included in the research, although on several occasions they were inadvertantly included. Such occurrences are recorded in footnote references. There were a total of approximately 1,700 Canadian graduates.

The data were obtained from the American Medical Association and provide extensive information on each physician. As the information of the AMA is constantly changing, the reader must remember the research was done with the data as of April, 1971, when it was obtained.

Included in the data are such items as place and date of birth, age, sex, medical school and date of graduation, speciality, board certification, a list of states, institutions and dates of internships and residencies, and current professional address. A record of government service history is also included (by date and branch but not location).

All the 1962 graduates of the California College of Medicine (approximately 2,320) were removed from the data field. They were former graduates of the Los Angeles College of Osteopathic Physicians and Surgeons who formally requested MD degrees and were

[1] The original data included 1955-1966 graduates. This research used only the 1955-1965 graduates. The 1966 graduates were omitted because approximately 50 percent of them were still in training.

awarded such after successfully completing an examination given by the California College of Medicine (U.C. Irvine, California College of Medicine).[2]

The valid graduates of the California College of Medicine receiving their MD degrees in 1963, 1964 and 1965 (numbering 95, 75, 88 respectively) are also removed from the data in most instances. This omission was done to alleviate the confusion caused by the 1962 graduates (former Osteopaths). When the 1963, 64 and 65 graduates are omitted, there is a footnote reference of explanation.

Sources of Other Data used in Chapter 5

Variable	Source
Population Deflator	U.S. Bureau of the Census. Statistical Abstract of the United States: 1965. 86th edition. Washington, D.C., 1965.
WMIN	U.S. Bureau of the Census. U.S. Census of Population: 1960. Subject Reports. State of Birth. Final Report PC(2)-2A. Washington, D.C., 1963.
PHY$	L. S. Reed. Studies of the Incomes of Physicians and Dentists. U.S. Department of Health, Education and Welfare, Social Security Administration, Office of Research and Statistics, 1968.
CSTLN	U.S. Department of Housing and Urban Development, Federal Housing Administration, Division of Research and Statistics. FHA Homes 1967. Data for States and Selected Areas. Washington, D.C.: U.S. Government Printing Office, 1967.
NATRPDT	U.S. Department of Commerce. Current Population Reports Population Estimates, Series P-25, No. 414. "Estimates of Population of States: July 1, 1967." Washington, D.C.: U.S. Government Printing Office, 1969.

[2] Medical School Alumni, 1967, p. 11.

Variable	Source
PHYPOP	C. N. Theodore and G. E. Sutter. Distribution of Physicians in the U.S., 1963, Vol. 1 and 2. Chicago: American Medical Association, 1967.
PUBGRD PRVGRD	U.S. Department of Health, Education, and Welfare. Health Manpower Source Book. Public Health Service Publication #263, Section 20. Washington, D.C.: U.S. Government Printing Office, 1969.
HSESTFF TCHBEDS	American Medical Association. Directory of Approved Internships and Residencies. Chicago: American Medical Association, 1966.

APPENDIX A-4

TABLE A-4

The Percent of the Native Whites Age 15-19 Living in a State in 1960 but Were Born in Other States for States with Medical Schools[a]

State		State	
Northeast		East South Central	
Vermont	26.7%	Alabama	14.1%
Massachusetts	18.1	Kentucky	17.2
Connecticut	27.6	Mississippi	22.1
		Tennessee	21.1
Middle Atlantic			
		West South Central	
New Jersey	28.9		
New York	15.7	Arkansas	18.7
Pennsylvania	11.6	Louisiana	17.1
		Oklahoma	26.9
East North Central		Texas	24.5
Illinois	21.6		
Indiana	24.4	Mountain	
Michigan	16.4	Colorado	44.6
Ohio	20.0	Utah	23.7
Wisconsin	14.6		
		Pacific	
West North Central		California	45.5
Iowa	16.3	Oregon	43.0
Kansas	31.3	Washington	37.4
Minnesota	15.6		
Missouri	23.7		
Nebraska	22.7		
South Atlantic			
Washington D.C.	58.2		
Florida	64.0		
Georgia	22.7		
Maryland	39.4		
North Carolina	20.6		
South Carolina	29.6		
Virginia	35.8		
West Virginia	11.1		

[a]Source: U.S. Bureau of Census. U.S. Census of Population: 1960. Subject Reports. State of Birth. Final Report PC(2)-2A. Washington, D.C., 1963, Table 26.

APPENDIX A-5

TABLE A-5

In and Out White-Male-Migrants ($x10^{-5}$)
between 1955 and 1960 for Selected States

State	Migrants		Ratio
	In	Out	In/Out
Alabama	0.990	1.052	0.941
Arizona	1.531	0.738	2.075
Arkansas	0.731	0.930	0.786
California	9.415	4.161	2.263
Colorado	1.382	1.126	1.227
Connecticut	0.979	0.860	1.138
Delaware	0.275	0.202	1.361
Florida	5.484	1.816	3.020
Georgia	1.486	1.461	1.017
Illinois	2.811	3.613	0.778
Indiana	1.550	1.846	0.840
Iowa	0.733	1.235	0.594
Kansas	1.102	1.510	0.730
Kentucky	0.983	1.462	0.672
Louisiana	0.912	0.853	1.069
Maryland	1.642	1.263	1.300
Massachusetts	1.362	1.739	0.783
Michigan	1.532	2.493	0.615
Minnesota	0.969	1.160	0.835
Mississippi	0.667	0.697	0.957
Missouri	1.586	1.892	0.838
Nebraska	0.544	0.858	0.634
New Hampshire	0.335	0.290	1.155
New Jersey	2.345	1.918	1.223
New York	2.502	4.890	0.512
North Carolina	1.375	1.475	0.932
Ohio	2.631	3.168	0.830
Oklahoma	1.114	1.433	0.777

TABLE A-5 (continued)

State	Migrants		Ratio In/Out
	In	Out	
Oregon	0.994	1.026	0.969
Pennsylvania	1.829	3.397	0.538
Rhode Island	0.398	0.443	0.898
South Carolina	0.898	0.797	1.127
Tennessee	1.214	1.524	0.797
Texas	3.481	3.574	0.974
Virginia	2.301	1.925	1.195
Washington	1.661	1.509	1.101
West Virginia	0.451	1.091	0.413
Wisconsin	0.954	1.166	0.818

SOURCE: U.S. Bureau of Census, U.S. Census of Population. 1960 Subject Reports. Mobility for States and State Economic Areas. Final Report PC(2)-2B, Washington, D.C., 1963, pp. 158-9.

APPENDIX A-6

TABLE A-6-1

Place of Practice in 1971 for Recent Male Graduates Who Were Born in and Went to Medical School in New York According to Whether or Not They Had a History of Government Service, by Selectivity of the Medical School of Graduation[a]

Selectivity Quartile of Medical School		Physicians With a History of Government Service[b]			Physicians Without a History of Government Service			Total		
		Physicians Practicing in New York		Total	Physicians Practicing in New York		Total	Physicians Practicing in New York		Total
		No[c]	Yes		No[c]	Yes		No[c]	Yes	
First	N	1,113	1,010	2,123	552	855	1,407	1,665	1,865	3,530
	%	52.4	47.6	100.0	39.2	60.8	100.0	47.2	52.8	100.0
Secord	N	153	130	283	96	123	219	249	253	502
	%	54.1	45.9	100.0	43.8	56.2	100.0	49.6	50.4	100.0
Fourth	N	162	127	289	98	124	222	260	251	511
	%	56.1	43.9	100.0	44.1	55.9	100.0	50.9	49.1	100.0
Total	N	1,428	1,267	2,695	746	1,102	1,848	2,174	2,369	4,543
	%	53.0	47.0	100.0	40.4	59.6	100.0	47.9	52.1	100.0

χ^2 statistic (and significance level) for the null hypothesis of no relationship between place of practice and the variable in the left-hand column.

Selectivity of Medical School	Physicians With a History of Government Service	Physicians Without a History of Government Service	Total
	1.492 $\alpha<0.50$	3.163 $\alpha<0.30$	3.158 $\alpha<0.30$

History of Government Service	First Quartile	Second Quartile	Fourth Quartile	Total
	59.119 $\alpha<0.001$	5.187 $\alpha<0.05$	6.835 $\alpha<0.01$	69.615 $\alpha<0.001$

[a]Based on the 1955-1965 graduates of American medical schools. Excluded are physicians in federal service, in training and having professional addresses other than the fifty states of the U.S. Selectivity ratings based on the average Medical College Admission Test scores of the entering class of 1966. (Unpublished data)

[b]U.S. military, U.S. Public Health Service, and Veterans Administration.

[c]But practicing in the U.S.

TABLE A-6-2

Place of Practice in 1971 for Recent Male Graduates Who Were Born In and Went to Medical School in Pennsylvania According to Whether or Not They Had a History of Government Service, by Selectivity of the Medical School of Graduation[a]

Selectivity Quartile of Medical School		Physicians With a History of Government Service[b]			Physicians Without a History of Government Service			Total		
		Physicians Practicing in Pennsylvania		Total	Physicians Practicing in Pennsylvania		Total	Physicians Practicing in Pennsylvania		Total
		No[c]	Yes		No[c]	Yes		No[c]	Yes	
First	N	554	554	1,108	317	518	835	871	1,072	1,943
	%	50.0	50.0	100.0	38.0	62.0	100.0	44.8	55.2	100.0
Second	N	292	334	626	173	280	453	465	614	1,079
	%	46.6	53.4	100.0	38.2	61.8	100.0	43.1	56.9	100.0
Total	N	846	888	1,734	490	798	1,288	1,336	1,686	3,022
	%	48.8	51.2	100.0	38.0	62.0	100.0	44.2	55.8	100.0

χ^2 statistic (and significance level) for the null hypothesis of no relationship between place of practice and the variable in the left-hand column.

Selectivity of Medical School	Physicians With a History of Government Service	Physicians Without a History of Government Service	Total
	1.802 $\alpha<0.20$	0.006 $\alpha<0.95$	0.844 $\alpha<0.50$
History of Government Service	First Quartile	Second Quartile	Total
	27.880 $\alpha<.001$	7.682 $\alpha<.01$	33.73 $\alpha<.001$

See Table A-6-1 for footnotes.

TABLE A-6-3

Place of Practice in 1971 for Recent Male Graduates Who Were Born In and Went to Medical School in Illinois According to Whether or Not They Had a History of Government Service, by Selectivity of the Medical School of Graduation[a]

Selectivity Quartile of Medical School		Physicians With a History of Government Service[b]			Physicians Without a History of Government Service			Total		
		Physicians Practicing in Illinois		Total	Physicians Practicing in Illinois		Total	Physicians Practicing in Illinois		Total
		No[c]	Yes		No[c]	Yes		No[c]	Yes	
First	N	60	25	85	45	25	70	105	50	155
	%	70.6	29.4	100.0	64.3	35.7	100.0	67.7	32.3	100.0
Second	N	129	72	201	58	63	121	187	135	322
	%	64.2	35.8	100.0	47.9	52.1	100.0	58.1	41.9	100.0
Third	N	336	288	624	194	244	438	530	532	1,062
	%	53.8	46.2	100.0	44.3	55.7	100.0	49.9	50.1	100.0
Fourth	N	95	137	232	50	88	138	145	225	370
	%	40.9	59.1	100.0	36.2	63.8	100.0	39.2	60.8	100.0
Total	N	620	522	1,142	347	420	767	967	942	1,909
	%	54.3	45.7	100.0	45.2	54.8	100.0	50.7	49.3	100.0

χ^2 statistic (and significance level) for the null hypothesis of no relationship between place of practice and the variable in the left-hand column.

Selectivity of Medical School	Physicians With a History of Government Service	Physicians Without a History of Government Service	Total
	33.71 $\alpha<0.001$	15.28 $\alpha<0.001$	44.90 $\alpha<0.001$

History of Government Service	First Quartile	Second Quartile	Third Quartile	Fourth Quartile	Total
	0.756 $\alpha<0.500$	8.168 $\alpha<0.010$	9.369 $\alpha<0.010$	0.795 $\alpha<0.010$	15.239 $\alpha<0.001$

See Table A-6-1 for footnotes.

TABLE A-6-4

Place of Practice in 1971 for Recent Male Graduates Who Were Born In and Went to Medical School in Ohio According to Whether or Not They Had a History of Government Service, by Selectivity of the Medical School of Graduation[a]

Selectivity Quartile of Medical School		Physicians With a History of Government Service[b]			Physicians Without a History of Government Service			Total		
		Physicians Practicing in Ohio		Total	Physicians Practicing in Ohio		Total	Physicians Practicing in Ohio		Total
		No[c]	Yes		No[c]	Yes		No[c]	Yes	
First	N	113	59	172	61	57	118	174	116	290
	%	65.7	34.3	100.0	51.7	48.3	100.0	60.0	40.0	100.0
Second	N	133	123	256	71	119	190	204	242	446
	%	52.0	48.0	100.0	37.4	62.6	100.0	45.7	54.3	100.0
Third	N	234	220	454	186	335	521	420	555	975
	%	51.5	48.5	100.0	35.7	64.3	100.0	43.1	56.9	100.0
Total	N	480	402	882	318	511	829	798	913	1,711
	%	54.4	45.6	100.0	38.4	61.6	100.0	46.6	53.4	100.0

χ^2 statistic (and significance level) for the null hypothesis of no relationship between place of practice and the variable in the left-hand column.

Selectivity of Medical School	Physicians With a History of Government Service	Physicians Without a History of Government Service	Total
	10.964 $\alpha<0.01$	10.511 $\alpha<0.01$	25.918 $\alpha<0.001$

History of Government Service	First Quartile	Second Quartile	Third Quartile	Total
	5.718 $\alpha<0.02$	9.403 $\alpha<0.01$	24.859 $\alpha<0.001$	44.318 $\alpha<0.001$

See Table A-6-1 for footnotes.

Tables A-6-5 thru A-6-7 (pages 166-168) have been removed because of the confidentiality of the Medical College Admission Test Scores

Tables A-6-5 thru A-6-7 (pages 166-168) have been removed because of the confidentiality of the Medical College Admission Test Scores

APPENDIX A-7

TABLE A-7-1

The Ratio of Total Physician Migrants to the Sum of Type "6" and Type "8" Migrants for Selected States[a]

State	In Migrants		Out Migrants	
	Estimate Based on the Migration Equations of ... Medical School Graduates		Estimate Based on the Migration Equations of ... Medical School Graduates	
	Public and Private[b]	Public[c]	Public and Private[d]	Public[e]
Alabama	1.16	1.11	1.32	1.07
Arizona	1.00	1.11	1.85	†
Arkansas	1.64	1.18	1.33	1.04
California	1.21	1.02	1.35	1.16
Colorado	1.17	1.02	1.38	1.14
Connecticut	1.09	1.21	1.36	†
Delaware	1.00	1.18	1.26	†
Florida	1.16	1.04	1.60	1.21
Georgia	1.49	1.11	1.26	1.05
Illinois	1.56	1.13	1.29	1.02
Indiana	1.52	1.03	1.22	1.06
Iowa	1.42	1.14	1.21	1.07
Kansas	1.40	1.11	1.29	1.16
Kentucky	1.39	1.17	1.33	1.09
Louisiana	2.31	1.04	1.25	1.07
Maryland	1.19	1.04	1.20	1.28
Massachusetts	1.38	1.27	1.18	†
Michigan	1.41	1.04	1.21	1.08
Minnesota	1.22	1.08	1.29	1.05
Mississippi	1.26	1.67	1.41	1.06
Missouri	1.48	1.30	1.42	1.03
Nebraska	2.84	1.07	1.22	1.08
New Hampshire	1.00	1.35	1.34	†
New Jersey	1.03	1.30	1.44	†
New York	1.51	1.35	1.19	1.08

TABLE A-7-1 (continued)

State	In Migrants		Out Migrants	
	Estimate Based on the Migration Equations of ... Medical School Graduates		Estimate Based on the Migration Equations of ... Medical School Graduates	
	Public and Private[b]	Public[c]	Public and Private[b]	Public[c]
North Carolina	1.35	1.11	1.30	1.04
Ohio	1.28	1.16	1.24	1.01
Oklahoma	1.58	1.15	1.39	1.04
Oregon	1.22	1.01	1.24	1.18
Pennsylvania	1.63	1.16	1.18	†
Rhode Island	1.00	1.36	1.37	†
South Carolina	1.36	1.12	1.32	1.08
Tennessee	2.00	1.07	1.22	1.28
Texas	1.56	1.08	1.26	1.06
Virginia	1.37	1.03	1.18	1.25
Washington	1.21	1.05	1.32	1.13
West Virginia	1.09	2.87	1.41	1.02
Wisconsin	1.29	1.06	1.22	1.08

[a]The point of departure for the estimates based on public and private school graduates was state of birth. The point of departure for the estimates based on public school graduates only was the state of the medical school. All statistics based on the 1955-1965 graduates of American medical schools and graduates of Canadian schools practicing in the U.S. in 1971. Only physicians in direct patient care in non-federal-non-medical school employment are included. The 1962 graduates of the California College of Medicine are excluded.

[b]Based on the state of practice; ratio of the sum of type "2," "3," "6," "8" physicians to the sum of type "6," "8" physicians.

[c]Based on the state of practice; ratio of the sum of type "5," "7," "6," "8" physicians to the sum of type "6," "8" physicians.

TABLE A-7-1 (continued)

[d]Based on the state of birth; ratio of the sum of type "2," "3," "6," "8" physicians to the sum of type "6," "8" physicians.

[e]Based on the state of medical school; ratio of the sum of type "5," "7," "6," "8" physicians to the sum of type "6," "8" physicians.

[†]State has no public medical schools.

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